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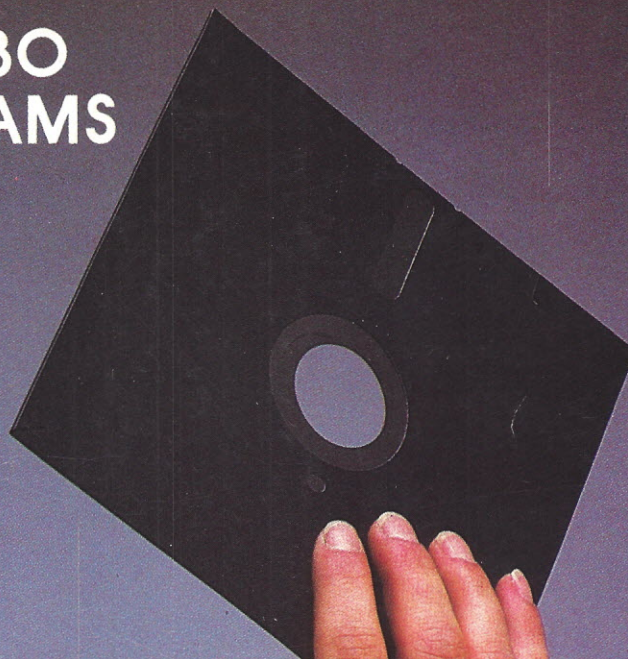
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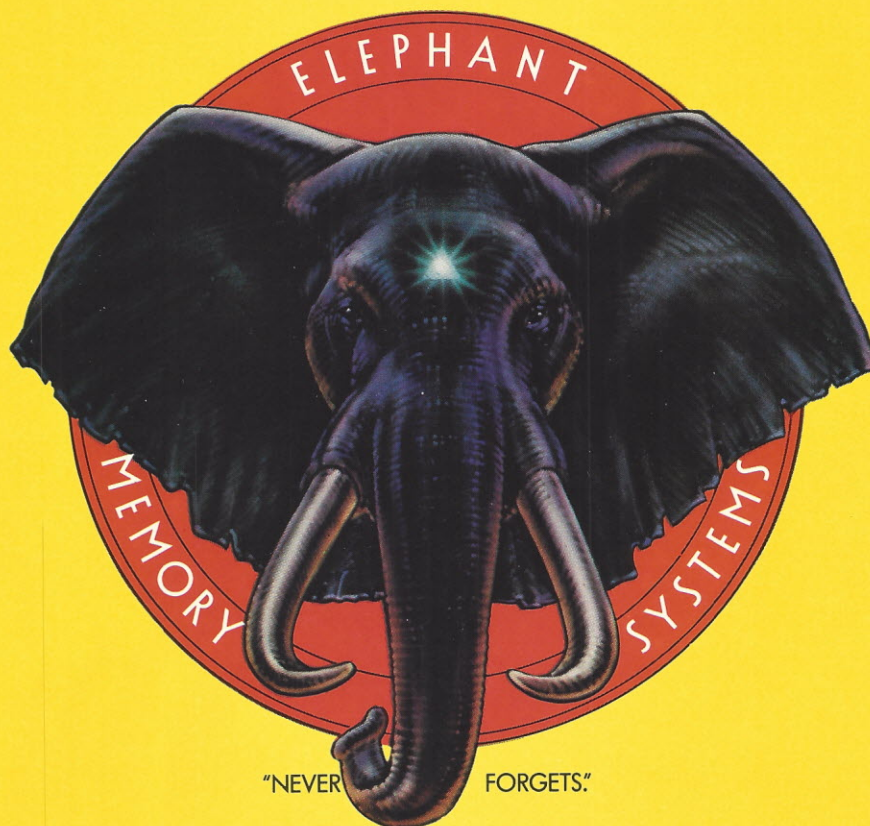


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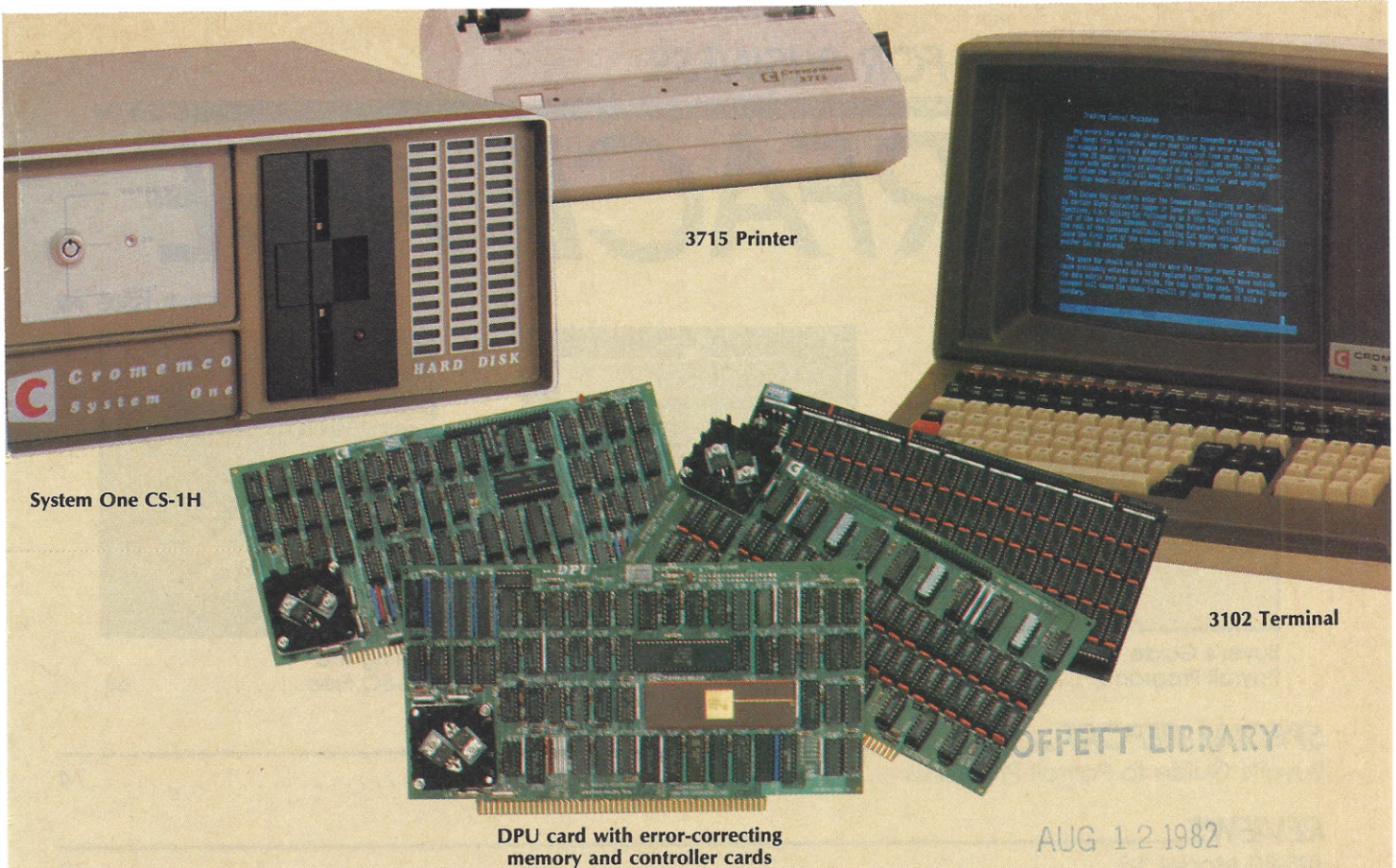
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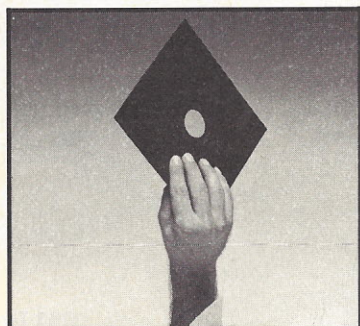
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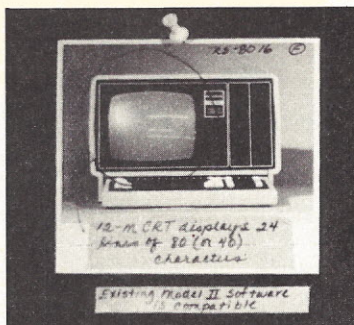
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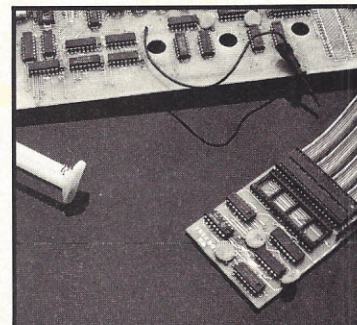
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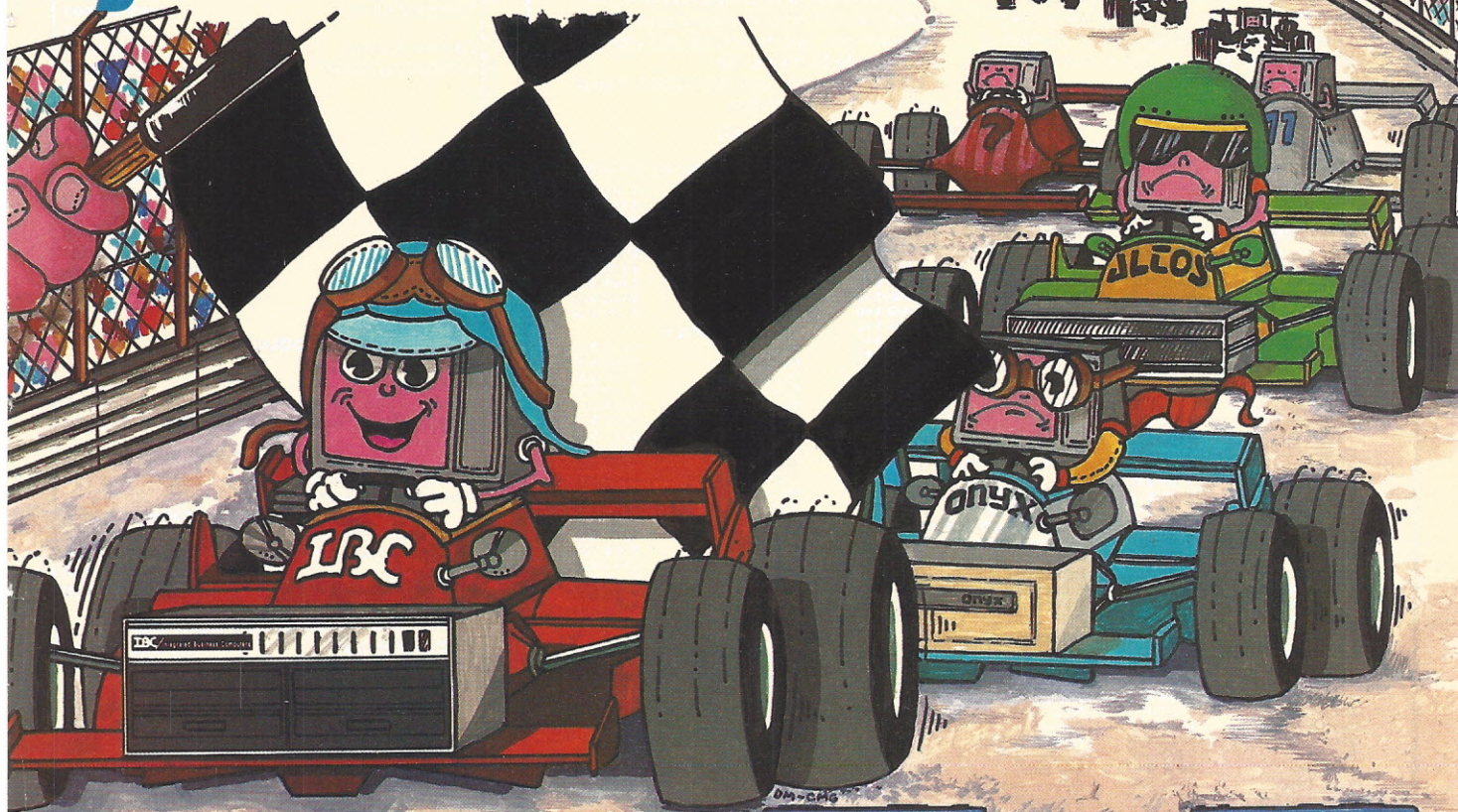
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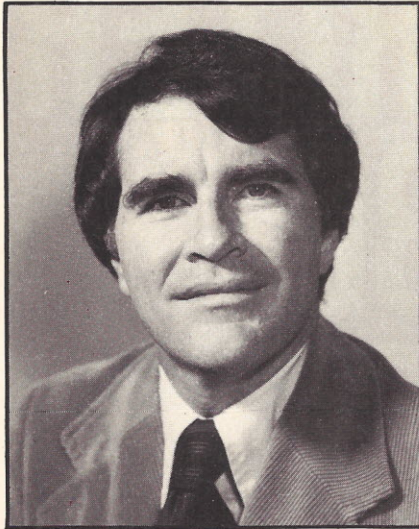


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Tom Fox
Technical Editor

Two words—ergonomics and user-friendly—dominated many conversations at the 1982 National Computer Conference (Houston, TX). Both terms describe the same idea: making computers adjust to people, rather than the other way around. Industry designers are becoming increasingly aware that performance of complex tasks at ever-quicker rates should be balanced by optimum useability.

The term ergonomics applies to hardware; user-friendly is largely a software term. At the NCC, the floor of Houston's Astrohall was filled with ergonomic video terminals and furniture. A common characteristic of both was motion. This year's vogue terminal has a movable keyboard and a screen that can swivel and tilt so that it faces the operator squarely, adjusting to his height and posture. Display screens glow in subdued avocado greens or brownish-orange sepia tones. Basic black-and-white is out this season, we are told.

The NCC remains a showcase for announcements in new technology. Several manufacturers of Winchester-technology disk drives showed 5.25-in. products of incredible capacity. Tandon (Chatsworth, CA) showed a 31M-byte model, while Evotek (Fremont, CA) and Micropolis (Chatsworth, CA) displayed examples holding over 50M bytes of data. (This will reduce to about 42M bytes when the surfaces are formatted for final use.) The precision drives had a typical access time of around 35 mS.

Also in the disk drive arena, we noted a strong tendency towards half-height floppies. This conserves space in the computer housing, and often results in a cost savings as well. A 500K-byte half-high 5.25-in. drive from Qume (San Jose, CA) is said to cost 30% less than standard floppies—computed on the basis of dollars per byte of capacity.

Laser printers are another concept with a promising future. They work on essentially the same principle of Xerographic office copiers, with laser beams forming the images on photosensitive drums. These printers are very fast (from 12 to 60 pages per minute), and output quality is outstanding. Although printers like these have been available for some time in large computers (at prices ranging from \$70,000 to \$180,000 per printer), technology is bringing the cost and complexity down dramatically.

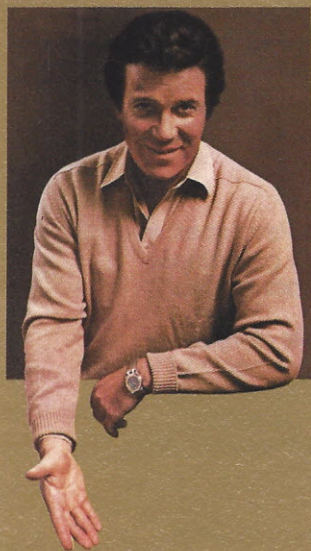
Perhaps the most hopeful sign was a tiny prototype laser printer installed at the last minute in the Epson (Torrance, CA) booth. Unannounced and unpriced, we think it's significant that it comes from a company known for quality low-cost printing hardware.

Incidentally, Epson showed two other experimental machines. Called "ink dot" printers, they are a variant of the familiar dot-matrix variety, featuring a pot of ink riding along with the print head instead of the traditional cloth or film ribbon. The print head has 24 wires (instead of the usual nine), and print quality was very good. One of the printers used black ink; the other, three phials of colored ink that mixed at the paper to form just about any color except black.

Not to be diminished by DEC's (Maynard, MA) show-stealing computer line (See "Product Highlight" *IA* Aug 82), are new low-cost entries from Cromemco (Mountain View, CA) and Epson. The Epson HX-10 is about as small as a computer can be and still include a full-sized keyboard. The keyboard, an 80-character flat-panel display screen, printer and cassette recorder fit neatly into a notebook-sized case. The Cromemco C-10 is a collection of proven ideas in a new package. The computer, full-sized terminal and single minifloppy disk drive are combined with CP/M and nearly \$1,000 worth of other software for just \$1,785.

Finally, we were exposed to a simple idea that may drastically change the approach to selling pre-packaged software. Soft-link (Los Altos, CA) has developed a means for encrypting a floppy disk program so that it must be "unlocked" before use.

Tom Fox



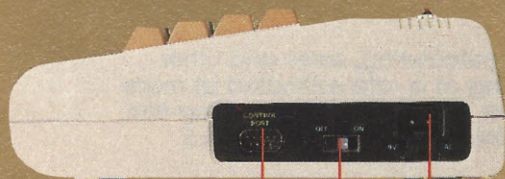
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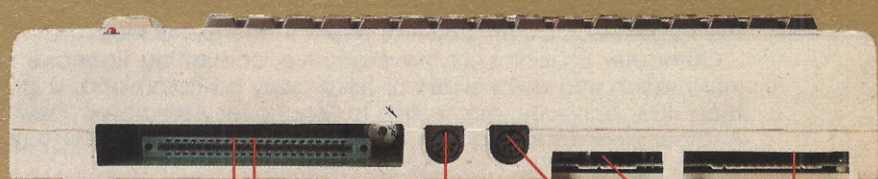
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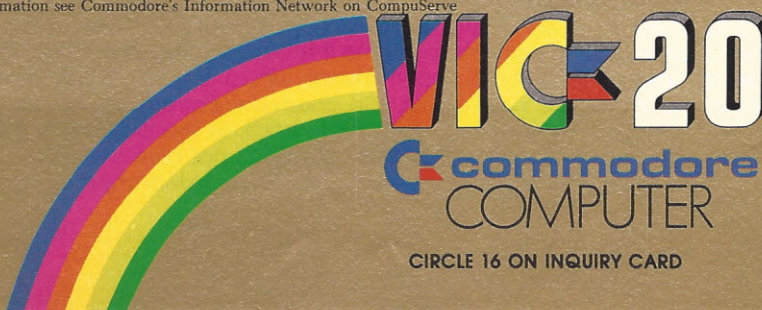
Read the chart and see why COMPUTE! Magazine¹ calls the VIC-20 computer "an astounding machine for the price." Why BYTE² raves: "...the VIC-20 computer unit is unexcelled as a low-cost consumer computer." Why Popular Mechanics³ says "...for the price of around \$300, it's the only game in town that is more than just a game." And why ON COMPUTING INC.⁴ exclaims: "What is inside is an electronic marvel... if it sounds as if I'm in love with my new possession, I am."

The wonder computer of the 1980s. The VIC-20 from Commodore, world's leading manufacturer of a full range of desktop computers. See the VIC-20 at your local Commodore dealer and selected department stores.

1 April '81 issue 2 May '81 issue 3 November '81 issue 4 Fall '81 issue

* Manufacturer's suggested retail price Mar. 1, 1982.

¹ For more information see Commodore's Information Network on CompuServe



CIRCLE 16 ON INQUIRY CARD

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INTERFACE AGE 7

Business data banks are introduced

VisiCorp (San Jose, CA) has entered into a joint business agreement with Data Resources, Inc. (Lexington, MA) to make available to personal computer users a significant bank of business and economic information. VisiCorp is the producer of the VisiSeries software products that began in 1979 with the VisiCalc electronic spreadsheet for financial planning.

DRI is an operating company of McGraw-Hill (New York, NY). The two companies will develop a software product that will give personal computer users access to DRI's comprehensive banks of more than 10 million business and economic data files. It will be made available in the form of preformatted VisiCalc models. These models will be automatically transferred to the personal computer, allowing users to combine job-specific business information with up-to-date external data.

Thousands attend graphics expo

Although the National Computer Conference (NCC, Houston, TX) may have been a more conspicuous trade show this summer, June was also host to the third annual conference and exposition of the National Computer Graphics Association (NCGA).

NCGA '82 (Anaheim, CA) accommodated more than 39,500 business and engineering leaders who toured 130,000 square feet of exhibits from 162 manufacturers to see the newest systems for transforming raw computer data into pictures, charts, 3-D drawings and animation. In other halls of the convention center and in nearby hotels, technical presentations were made by about 200 graphics specialists covering 17 subject areas. NCGA '82 is alleged to have been the largest computer graphics event in the world thus far.

Computer graphics for the executive, converting financial, manufacturing, sales and other information into color slides or hard-copy on command, is growing at a rate estimated at more than 40% annually, according to Machover Associates (New York, NY), graphics consulting firm. Another New York research firm, Frost & Sullivan, projects a graphics sales volume of \$14.5 billion before 1990.

Xerox faces critical test

In recent months, the American consumer and investor have become increasingly aware that Xerox is having severe identity problems. Recently, the company's management has placed emphasis on diversification because it is believed the market for stand-alone copiers will decline as the paperless office becomes a reality. With the focus on automation, the company is trying to ward off fierce Japanese competition in the plain paper copier field. Northern Business Information (New York, NY) maintains that Xerox's share of the U.S. copier market fell from virtually 100% in 1970 to 43% in 1981. The research firm reports that operating margins fell during the same period from 29.9% to an estimated 14.1%.

In office automation, Xerox's strategy is predicated on turning placements of its much publicized local area network, Ethernet, into sales of workstations and peripherals. A corollary of this strategy is emphasizing automation for office professionals and executives. Xerox studies have shown that salaries for these two groups represent the largest part of office expenses. The company introduced its Star professional workstation and the 820 personal computer in 1981 to tap the executive and professional markets.

The success of Xerox's office automation strategy hinges on how well the company takes advantage of the time lead Ethernet enjoys over the competing broadband system from Wang (Lowell, MA) and expected systems from IBM (Boca Raton, FL) and AT&T (New York, NY).

Tymshare awarded \$20 million Western Electric contract

Western Electric (New York, NY) has awarded Tymshare, Inc. (Cupertino, CA) a multi-year multi-million dollar contract to provide computer and support services for planning activities. Tymshare support spans integrated marketing information systems, force management, productivity improvement systems, and decision support systems to Western Electric for the Bell System.

Laser technique may reduce size of computer chips

Laser-generated X-rays may be able to etch as much as 100 times the amount of information currently contained on most large-scale integrated circuits—computer processing and memory units. This could lead to substantially more compact computers. In the process, called microlithography, a laser pulse is focused on a metal target. This produces a hot surface plasma, which emits X-rays. The X-rays then illuminate a mask that contains the desired circuit pattern. The mask's pattern allows certain rays to pass on to a thin film of material, which reacts chemically in areas exposed by the X-rays. When the thin film is developed, the chemical pattern produced by the X-rays is etched into its surface, forming a layer of an integrated circuit. In the past, ultraviolet light usually has been used to illuminate the mask. But, ultraviolet light does not give the high degree of resolution that X-rays can provide. The process is being refined by researchers at Battelle Laboratories (Columbus, OH).

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CIRCLE 2 ON INQUIRY CARD

SEPTEMBER 1982

INTERFACE AGE 9

PRODUCT HIGHLIGHT

Sony Enters Desktop Market with SMC-70

Sony Corporation of America (New York, NY) will begin distribution of a new business-oriented microcomputer this month. Competitive pricing and advanced service technology lead industry observers to contend that this machine will make a bid for a formidable share of the market.

Weighing in at 10.6 lbs. and measuring 14.5-in. wide by 17.5-in. deep and 3.5-in. high, the basic SMC-70 system has 64K bytes of user memory, which can be expanded by adding 192K bytes of bank-select memory. For more performance, an adaptor unit converts the Z80A system to an 8086 16-bit system with either 128K bytes or 256K bytes of on-board memory—such an upgrade requires no change in peripherals. A unique slide-out tray accepts snap-in expansion modules for interfacing accessories or extending system capabilities.

There is an internal diagnostics capability on the SMC-70, which runs a failsafe test on unit readiness each time the power is switched on. Another device on the disk drive provides a complementary check of peripherals. Sony contends that service locations will be supplied with "field replacement blocks," which facilitate replacement of large sections of the unit, rather than requiring component-level repair.

The keyboard is a full alphanumeric Qwerty-type with 72 keys, including five for programmable function, three for editing and five for cursor. For display, users may choose between color monitor, green monitor, or standard color TV set, and opt for either letter-quality or dot matrix printers. Modems for telecommunications uses are supported as well.

Thirteen resident I/O interfaces are standard. Among them are a Centronics-type parallel port, an RS-23C serial interface, RGB video and B/W composite video, a light pen, a numeric key pad and tape cassette interface. Resident also are five free I/O ports and a connector for an expansion box, which contains five additional I/O ports. A battery back up clock/calendar, system test diagnostics and a tone generator are additional features.

The SMC-70 incorporates a slightly modified CP/M operating system and offers two versions of Basic—one compiled and one interpreted. Primary applications packages are said to include a spreadsheet, word processing, database management and communications.

Four different levels of graphics are standard. At a low-resolution level, the system displays graphics in up to 16 colors and stores these on four pages for animation or comparisons. At the highest level, with 640-by-400 picture elements, graphics may be displayed in green or black-and-white.

The system's storage options begin with the 3.5-in. floppy disks providing 280K bytes of formatted capacity per drive. Two of these drives can be mounted to the main processor console to become an integral part of the system. Also available will be a high density floppy disk, a 6M-byte hard disk system and a 256K-byte cache memory device.



An SMC-70 with dual drives and expansion modules in place.



A typical business configuration might include the basic unit SMC-70 (\$1,475), dot matrix printer SMI-7020 (\$800), green monitor CPD-120 (\$375) and monitor stand SMK-0091 (\$60), numeric key pad SMI-7060 (\$90) and two integrated floppy disk drives SMI-7012 (\$1,100).

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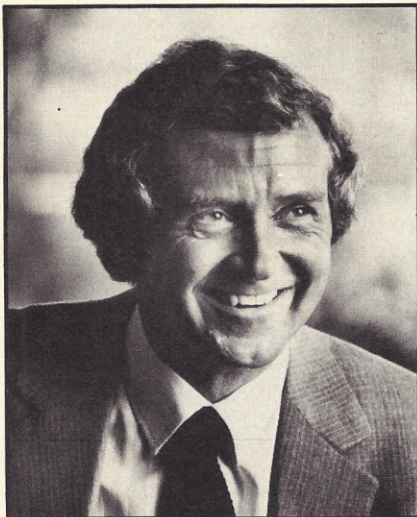
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CIRCLE 29 ON INQUIRY CARD



David Jackson
President
Altos Computer Systems

The minicomputer, which has long been at the cornerstone of business operations, is hardly extinct, but its niche is steadily being usurped by a simpler, more reliable technology. Minicomputers have become impractical and cumbersome when compared with the simplicity of single-board tools. The top-end micro is blurring the distinction between itself and the mini. The result will be an explosion at the top-end of the micro market.

I believe that, in the long run, mini-technology will die out completely, and large, healthy minicomputer companies such as DEC will eventually be shipping nothing but micros. The transformation is already taking place, and the reasons have to do both with improved technology and manufacturer attitude.

Advances in local area networking and high-capacity media storage alone allow the microcomputer to provide all the services of a mini at less cost—with more flexibility.

When launching Altos Computer Systems (San Jose, CA) five years ago, my working assumption was that the microcomputer industry would overtake and eventually replace the minicomputer industry. I tried to emulate DEC and Data General in an era when most everyone else was trying to be another Apple.

Not that Apple wasn't a tempting goal. The company focused the industry on the huge profits to be gleaned in the personal computer market, and to the extent that this raised competition and sparked innovation, it was a healthy trend.

In this technological gold rush, the customer was not always the winner. For one thing, marketing and high visibility became the sole touchstones to success, often at the expense of the machine's engineering. For another, the technology has largely been kept so proprietary that users don't buy a system as much as marry into one.

This is changing. In the last few years, customers have grown savvy enough not to buy a desktop, single-user system when their future growth will require more. The industry, too, has become more sophisticated with respect to the needs of its business users. Apple's decision to remove its machines from mail order outlets reflects the realization that the computer is not a toy, but a tool—and an intricate one at that.

But this is just a beginning. If microcomputers are to truly succeed in the minicomputer niche, the industry as a whole must—excuse the expression—*grow up*.

A serious effort must be made to identify industry standards and adapt them, rather than attempt to keep a proprietary handle on everything. The present situation reminds me of what the recording industry would be if every company selected its own RPM.

Many of the standards for microcomputer already exist. For operating systems, they are clearly CP/M, MP/M and UNIX. In processors, there is the Z80, the 8086 and the 68000. Ethernet is already the de facto standard for local area networks, and we have adopted it, along with a twisted cable subset.

Multi-user capability is another area demanded by a potentially explosive business market. My guess is that many vendors are going to use the emerging 16-bit technology to make systems that are more user-friendly—that's certainly laudable. We have taken a different approach, however, and are providing powerful eight-station multiuser systems that can be networked. Even our low-end model comes with MP/M installed and hosts up to three terminals.

The practice of offering business tools has not had the limelight or the glamour associated with the Apples of this world, and perhaps that's been to our advantage. Ultimately, I think, the task of filling the minicomputer niche boils down to supplying users with a set of workable tools. That's just what DEC—a company that I much admire—did by offering its PDP series a decade ago, and it's what we're trying to do with our family of multi-user systems.


```

dir b:
B: /DISK#3      : SP      COM: PERRY   LET : WSOVLY1  OVR
B: OPMEM#1      LP2    : DM2/15  LET : CARDFILE COM : MARGIN2
B: FNPROD       PT     : JAN      DAT : SYNOPSIS DOC : DRPLI   PT
B: MIDDAY       MEM    : KSYN     DOC : DRSYN   PT : EXTERN  MEM
B: EXTERN2      MEM    : DAVID   NDX : FEB     DAT : SYN     DAT
B: CONT         PR7    : OSB-1/29 PT : MARCH   DAT : PROJ2   DAT
B: OLSON        LET    : EP      ART : PERRY2  LET : FN      COM
B: SANDERS      MEM    : WS      COM: SHOW    COM : FUNCT   ART
B: INTRO        ART    : EXPERT  LP  : DW      CMD : PHILLIPS LET
B: DM3/1        LET    : SYNOPSIS TOC: DAVID   DBF : DMW     LET
B: DAVID2       DBF    : CF      DAT : CHARTAX2 IXB

```

LOST

```

PERRY.LET
/DISK #3
..Date: 2/9/81
..Author: Pro/Tem (PB)
..Addressee: Terry Perry
..Subject: SYNOPSIS advertisement

```

```

PERRY2.LET
/DISK #3
..Date: 2/23/82
..Author: Pro/Tem (PB)
..Addressee: Terry Perry
..Subject: SYNOPSIS: outline of functions

```

```

DM3/1.LET
/DISK #3
..Date: 3/1/82
..Author: Pro/Tem (JLB)
..Addressee: Digital Marketing (RB)
..Subject: SYNOPSIS-2 (for doc & nondoc files)

```

Press "N" to start New search; "X" to eXit to menu
Press any other key to continue listing:

FOUND

SYNOPSIS™ automatically maintains a central index of document files created by word-processing programs such as Wordstar™, Spellbinder™, SuperWriter™, and Magic Wand™. It will also catalog non-document files including machine language programs and files created by spreadsheet and database programs. The index contains the filename, the Disk I.D., and four user defined lines of information about each file; for example: date, writer, addressee, and subject.

CP/M disk directories limit filenames to eight letters. A user having many different files can easily forget which filename contains what file and what disk it is on. SYNOPSIS creates one master index of all files on all disks, and includes comments in each file to facilitate retrieving specific data.

To use SYNOPSIS:

1. When writing a document file, you enter the four lines of information as non-printing "comment" lines at the top of each file, for example:

```

..Date: 3/1/82
..Author: Pro/Tem (JLB)
..Addressee: Digital Marketing (RB)
..Subject: SYNOPSIS-2 (for doc & nondoc files)

```

SYNOPSIS requires 48K RAM. Formats: 8" IBM soft-sectored, North Star DD, Micropolis Mod II, Superbrain 3.0, Apple II with CP/M, 5 1/4" and 8" Xerox 820, and Osborne-1.

SYNOPSIS is a trademark of Pro/Tem Software, Inc.
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SuperWriter is a trademark of Sorcim.
(CP/M is a trademark of Digital Research, Inc.)

PRO/TEM

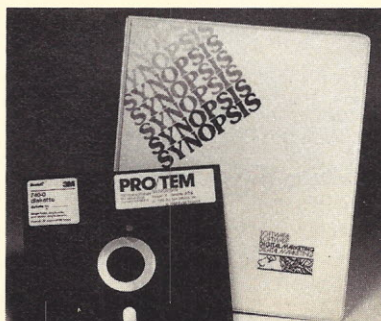
CIRCLE 28 ON INQUIRY CARD

2. After you have finished writing one or more files, run SYNOPSIS, which automatically enters the four comment lines plus the filename and Disk I.D. into the index.
3. You can search the index for words and phrases in one or more of these six categories or "fields." For example, you can search broadly for all documents concerning SYNOPSIS; or you can search more narrowly for all letters written in February to Terry Perry about SYNOPSIS. SYNOPSIS displays the full entry of each file it finds.
4. The user can change the prompts (Date, Author, Addressee, and Subject) to any others, such as: Date, Project, Draft, Section.

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A 16-bit microprocessor that can improve speed and productivity.

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Or the 10 programmable function keys that let you bid goodbye to the tedium of repetitious tasks.

And the list goes on. Which is why we've included a box (at right) that tells all.

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Some of the best things about the IBM Personal Computer aren't part of the computer.

Like the instruction manuals that help you set up your system and teach you to use it with the greatest of ease.

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Microprocessor 16-bit, 8088*		Color/Graphics <i>Text mode:</i> 16 colors*
Auxiliary Memory 2 optional internal diskette drives, 5¼", 160K bytes or 320K bytes per diskette	Operating Systems DOS, UCSD p-System, CP/M-86†	256 characters and symbols in ROM*
Keyboard 83 keys, 6 ft. cord attaches to system unit*	Languages BASIC, Pascal, FORTRAN, MACRO Assembler, COBOL	<i>Graphics mode:</i> 4-color resolution: 320h x 200v*
10 function keys* 10-key numeric pad Tactile feedback*	Printer Bidirectional* 80 characters/second 12 character styles, up to 132 characters/line*	Black & white resolution: 640h x 200v* Simultaneous graphics & text capability*
Diagnostics Power-on self testing* Parity checking*		Communications RS-232-C interface Asynchronous (start/stop) protocol Up to 9600 bits per second

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How to chart your company's fortune without spending one

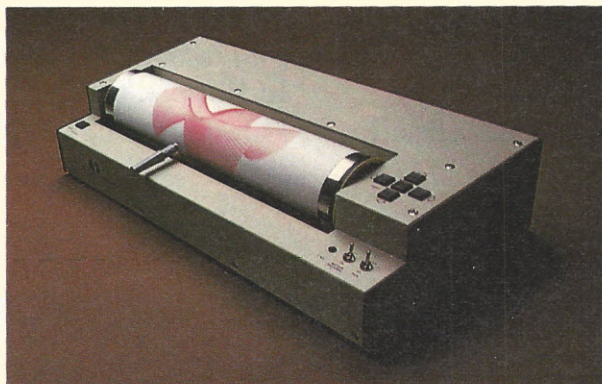
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The Strobe System transforms complex data into dynamic, colorful visuals with a few simple commands from your computer. Charts and transparencies that once took hours to produce are plotted within minutes. Information can be presented as bar charts, pie charts, curves or isometrics in a variety of colors. And with a resolution of 500 points per inch, the Strobe 100 matches or surpasses the quality of plotters costing thousands of dollars more.

You can also save and modify your graphics through Strobe's menu-driven programs. A broad selection of software—including data base management-compatible programs—is now available.

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The Strobe Graphics System

Seeing is believing

16-bit machines

I would like to see a test of the new and older 16-bit machines—Fortune 32:16, Radio Shack Model 16, Wicat, etc. You should run a comparison test, like you have been doing with the 8-bit machines.

William N. Cox, Jr.
Baton Rouge, LA

We have a comparison of 16-bit systems in the works for our November issue. A review of the TRS-80 16 is featured elsewhere in this issue.—ed.

Product review updates

Regarding your inclusion of our Solomon Series Software in your general ledger review (JA Apr 82) and A/P, A/R review (JA Jun 82), we would like to point out a few misinterpretations.

First, TLB does provide Hotline support. Second, our GL is completely flexible and allows users to define specialized accounts and supports three-digit profit centers. Third, our user manuals have extensive indexing and cross reference capabilities.

Finally, the price you've quoted (\$3,495) is for Solomon II, our completely integrated accounting package built around the MDBS database, which includes an extensive job costing feature for service-oriented businesses.

Thomas D. Reardon, Jr.
TLB Assoc.
Findlay, OH

Thank you very much for the review of the Eagle II (JA Jun 82). There are a few comments I would like to make on the article's content. There are now five Eagle Computers, the new models integrating a hard disk drive in place of one floppy drive. These were introduced at the time of your review, so you could not have included them.

Another fact: the video displays 80-by-24, not 80-by-12, as is stated in your article. There is also a misconception about the programmability of the accounting software. The source code is available in order for a programmer to make alterations. Many programmers using the Eagle find it a delight to use. We do not promote this usage, but there is no reason for a programmer to avoid our product. We do sell CP/M and thus claim the same program availability as other manufacturers using this operating system. Many programs such as SuperCalc, Dbase II, and WordStar have been used successfully. These are the only

errors we have found in an otherwise professional piece.

Michael Nalls
Eagle Computer
Los Gatos, CA

We'd like to thank you for reviewing our product, the Lazy Writer word processor in your word processor comparison (JA Apr 82). We'd like your readers to know we've added some capabilities to our program since that review appeared. We now have a special extension called FORMATTER that lets one see line breaks and page breaks before text is printed. This is extremely useful with very long text, or any kind of text that must be "camera ready." Using FORMATTER, one can completely control the appearance of text before it is printed.

We have another extension that allows one to change many of the default values in Lazy Writer. You can choose cursor size, shape and speed. You can set in permanent tab settings. You can also set in any printer defaults that you may want.

The program will allow sending control codes to printers. This means you can do superscripts/subscripts or by-code underlining with a daisy wheel printer and get double-wide and compressed type with a dot matrix printer. In addition, use of these codes lets you make elaborate graphics with a printer like the MX-80.

Theresa Welsh
ABC Sales
Detroit, MI

The word processor comparison was very informative. A sophisticated program not included is Copyart—the only word processor that allows the use of graphics in your text. Graphic charts can be drawn right in the middle of your document. Several other advanced features are included with the package.

Michael Hopkins
Simutek Computer Products
Tucson, AZ

Re: the review of *Super Stellar Trek* ("Game Corner" JA Jun 82), it appears that there is a misunderstanding of that instruction manual. Two sections of those instructions seem to have been overlooked during the review process. The first was the description of the galaxy. The second was the description of the technique used for starship movement.

The galaxy is described clearly on page 1, paragraph 5 of the instruction manual.

Automatic movement, although described thoroughly on page 11 of the manual is completely ignored in the review. The automatic movement option utilizes the absolute addressing technique used with the other commands. The relative addressing technique is used only with manual movement. This relative movement is, in fact, deliberately made difficult, as it must be used whenever the ship's computer is damaged. This difficulty provides motivation for the commander to avoid critical hits in combat.

One other concern, although it is not an inaccuracy, is the absence of an explanation of the facility for toggling the displays. Paragraphs 8 and 9 of the review both refer to the switch, but seem to leave the reader with the feeling that such a switch is a cumbersome operation.

In reference to the row/column identification of quadrants and sectors, I as well as many others agree with your suggestion that the X, Y system be substituted. The use of the row/column method is a tradition begun a long, long time ago by an unidentified charter Trekkie.

Tom Burlew
Simi Valley, CA

Thank you for your column describing our product, the Softbox ("Commodore Logbook" JA Jun 82). We have recently introduced our products in the states, and are handling all sales and distribution from our local office.

Kathy Orlando
Small Systems Engineering,
222 B View St.,
Mountain View, CA 94041

I was amazed by your review of proofreading programs (JA May 82). Your reviewer stated that she declined to review Hexagon Systems' Hexspell program because "it could not deal with capital letters." The program will indeed ignore upper case words if requested, but this is only an option, not mandatory. The program only asks three questions before checking a document. Firstly, what file do you want to check. Secondly, where do you want to store the checked text. And last, "Check words containing upper case?"

Bernard J. Hughes
Hexagon Systems
Vancouver, B.C., Canada

Look for a review of the enhanced version of Hexspell in an upcoming issue. —ed.

As our spreadsheet program, Fast Figure, was just recently introduced, it was not included in your comparison article (JA Jul 82). The program has features comparable to those listed.

James P. Beirs,
Hourglass Systems
Glen Ellyn, IL

Archaic rock idols

Alas, we must all on occasion face the editor's pen. But I must take a light-hearted exception to the typo (or so I presume it to be) that appeared in my June column ("Apple-ications"). The second paragraph reads: "Many of today's teenagers may have been replaced by archaic rock idols with contemporary technical heroes like Steve Wozniak, Bill Budge, and other programming wizards."

As it now stands, the sentence conjures up images of graying rock-and-rollers replacing today's teenagers. My original, although admittedly no masterpiece of clarity, was worded: "Many of today's 12-year-olds may have replaced my rock idols with technical heroes like Steve Wozniak, Bill Budge, and other programming geniuses."

Tony Dirksen
Cupertino, CA

The Last One

I noted with interest your review of The Formula (JA May 82). Have you heard of a similar program called The Last One, and if so, do you have plans to review it?

Robert Brents
Bonita, CA

Look for a review of The Last One program-generation software (from Southwest Microcomputer Systems, San Diego, CA) in an upcoming issue. —ed.

Vic-20 additions

I read David D. Busch's article "Vic-20: Commodore's Entry in the Small Computer Arena" (JA May 82) with much interest.

I am presently debating the selection of a small personal computer and was deciding between the Vic-20 and the Atari 400 prior to reading your column. Your article convinced me to go with the Vic-20, especially your comments regarding the 22-column display and the ability to

remedy this drawback with "add-ons and user programs."

Armed with this new-found knowledge, I decided to purchase the Vic-20 and went to the local authorized Commodore Dealer/Service outlet. I asked about the add-ons and/or programs available to expand the screen beyond the restricted 22-column display and was told nothing is available; if I purchased, I would have to live with the display as is. Subsequently, I did not purchase—partly out of disappointment, but mostly because of the dealer's attitude.

Now I am back to square one in my selection process and would appreciate any information you can provide in regard to what add-ons and/or programs are available to expand the display and where they may be available.

Ed Ronalder
Houston, TX

Since the publication of my review, I have received many phone calls and letters from readers asking about add-on boards or programming to expand the 22-character screen width to a more usable format.

Such options are plentiful, although at this writing, Commodore has revealed no plans to upgrade the Vic-20 to 40 or 80 columns. However, other manufacturers have already announced add-on modifications. These range in price from \$150 to \$500. I cannot recommend specific brands, because I have not seen them in operation. By the time this is published, Commodore and several other manufacturers will have low-cost computers available that might better suit the needs of those who require the wider screen width.

One caution: a Vic-20 displaying 80 columns would require a color monitor instead of the inexpensive television receivers that can be used now. Even given an additional cost of \$600 or more for add-on board and monitor, I feel the Vic-20 represents a good value.

My main complaint about the Vic-20 to date has been slow delivery on new products. The disk drives announced last year were still not in the stores by mid-1982. But keep in mind that the Vic is still a very new machine. Once the product matures a bit, peripherals, accessories and add-ons of all types should be readily available.

For some, software may provide some of the solutions. The Vic-1211A Super Expander cartridge allows addressing individual dots on the screen in much greater detail than is possible in normal 22-column text or graphics mode. The Vic Gamegraphics character set editor permits the programmer to define new symbols, using an 8-by-8 dot matrix, as outlined in my review. Both of these tools are available now.

—DDB

Atari accessories update

Roger H. Edelson certainly provides clear and concise copy in his articles, but "Three Non-Atari Accessories for the Atari 800" (JA Jun 82) leaves one question for those who desire large RAM for rapid business application.

Is it possible to install two Mosaic 32K-byte boards in the Atari 800? Since the Mosaic company promotes a companion board, I presume three 32K boards are not feasible. Two 32K boards and the 16K Atari module would provide a very useable total of 90K, to be used with a view toward the limitations of the 6502 chip.

The whole review deals with only a total of 48K bytes. What can be done with the space remaining when a 16K and 32K combination is used? Also, is it possible to install the 128K Axlon Ramdisk in this space?

J. Leo Brueggeman
Somerset, NJ

Neither I, nor even Atari, recommend the Atari 800 for business applications. However, let's examine the prospects of increasing the Atari 800's memory space. In effect, 48K bytes is the maximum RAM space useable at any one time. The 6502 CPU chip will support a 64K-byte address space, but approximately 16K of the upper area is reserved for the operating system and other associated functions.

At the present time, the Mosaic 32K-board is not compatible with the Axlon Ramdisk, but Axlon does make a 32K board that will work with its 128K device; we will be reviewing this memory board in a later issue. With the Axlon board in place, it is possible to install the Axlon Ramdisk in the unused space. Actually, this will even leave you with one more board slot.

—RHE

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Sep 2-3 Indianapolis, IN, *Computer trade show* features national, regional and local exhibitors. Ernie Kerns & Assoc., 2555 E. 55th Pl., Suite 201, Indianapolis, IN 46220.

Sep 8-11 Atlantic City, NJ, *IBM PC Annual Convention and Exhibition.* Products and programs will be displayed. Sponsored by Personna. Atlantic Data Supply Corp., Highway 88, Brick, NJ 08723.

Sep 11-12 Newark, NJ, *Microcomputer Show and Fleamarket.* Commercial exhibitors and fleamarket sales. Kengore Corp., 3001 Route 27, Franklin Park, NJ 08823.

Sep 13-16 Cambridge, MA, *Micromputers at Laboratory Instruments workshop* will combine tutorials and laboratory hands-on sessions. TERC, 8 Eliot St., Cambridge, MA 02138.

Sep 14-16 Anaheim, CA, *Mini/Micro Conference and Exhibition* is not a user-oriented show; designed for a more specialized OEM audience. Electronic Conventions, 999 N. Sepulveda Blvd., El Segundo, CA 90245.

Sep 20-23 Chicago, IL, *Management information systems conference* will address the subject of corporate planning and information management, including telecommunications and database management. SMIS, Suite 600, 111 E. Wacker Dr., Chicago, IL 60601.

Sep 20-24 Toronto, Canada, *International Symposium on Subscriber Loops and Services* will be concerned with strategies for economically introducing services into the telecommunications network. The Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, NJ 08854.

Sep 21-24 San Francisco, CA, *Foreign Language Instructional Technology Conference* will address application of electronic technology to improve foreign language teaching.

Sep 22-Oct 1 Paris, France, *International trade show* will encompass data processing, telematics, communication, office organization and office automation. SICOB, 4 et 6, Place de Valois, 75001 Paris, France.

Sep 28-30 Washington, D.C. *Federal Computer Conference* is a forum for information exchange by Federal ADP users. Federal Education Programs, Box 368, Wayland, MA 01778.

Sept 29-Oct 1 Anaheim, CA, *International Peripheral Equipment and Software Exposition* is devoted exclusively to evaluation, selection and application of peripherals and software. Cahners Exposition Group, 222 W. Adams Street, Chicago, IL 60606.

Oct 1-2 San Jose, CA, *Conference on Classroom Applications of Computers* includes workshops, field trips, speakers and commercial exhibits. Computer-Using Educators, P.O. Box 18547, San Jose, CA 95158.

Oct 5-7 Phoenix, AZ, *Southwest Semiconductor Exposition* will feature manufacturing suppliers of equipment and materials dedicated to semiconductor, PCB and hybrid industries. Carlidge & Assoc., 491 Macara Ave., Suite 1014, Sunnyvale, CA 94086.

Oct 5-7 Anaheim, CA, *Western Design Engineering Show* will spotlight computer-aided design (CAD) and computer-aided manufacturing (CAM). Clapp & Poliak, Inc., 708 Third Ave., New York, NY 10017.

Oct 11-14 New York, NY, *Information Management Exposition & Conference* concentrates on management aspects of information and will devote intensified attention to software. Clapp & Poliak, 708 Third Ave., New York, NY 10017.

Oct 12 Newton, MA, *Single source computer show* is for OEMs, sophisticated end users, dealers and distributors. Norm De Nardi Enterprises, 289 S. San Antonio Rd., Suite 204, Los Atos, CA 94022.

Oct 17-20 Chicago, IL, *Data processing management conference and exposition* focuses on operational management. Data Processing Management Assoc., 505 Busse Highway, Park Ridge, IL 60068.

Oct 20-23 Singapore, *Personal Computer Show* will feature displays on every aspect of small computers. Overseas Exhibition Services Ltd., 11 Manchester Square, Condon WIM5AB, United Kingdom.

Oct 21-24 Los Angeles, CA, *National Computer Conference and Expo for Educators* will offer seminars, workshops, demonstrations and exhibits. Judco Computer Expos, Box 963, Scottsdale, AZ 85252.

Oct 26-28 Reno, NV, *CAD/CAM Conference* will focus on advances in computer-aided design and manufacturing technology, including such areas as interfacing, facilities planning, numerical control and architectural engineering. CAM-I Conferences, 611 Ryan Plaza Dr., Suite 1107, Arlington, TX 76011.

Oct 28-31 Washington, D.C., *Computer and office equipment show,* Computer Expositions, Inc., P.O. Box 3315, Annapolis, MD 21403.

Oct 29-30 Visalia, CA, *County Computer Faire* will provide an assortment of exhibits and seminars encompassing home, school and business microcomputer applications. College of the Sequoia, 915 S. Mooney Blvd., Visalia, CA 93277.

Oct 31-Nov 3 Barcelona, Spain, *Payment System Symposium* will feature discussion of bank automation developments, cash dispensing, home terminals, electronic payments clearing and communications networks as well as product and service displays. William H. Moore, 100 Peachtree St., Atlanta, GA 30303.

GOOD NEWS

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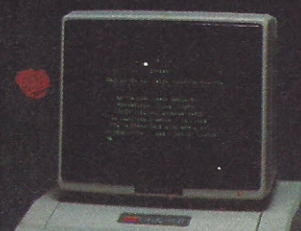


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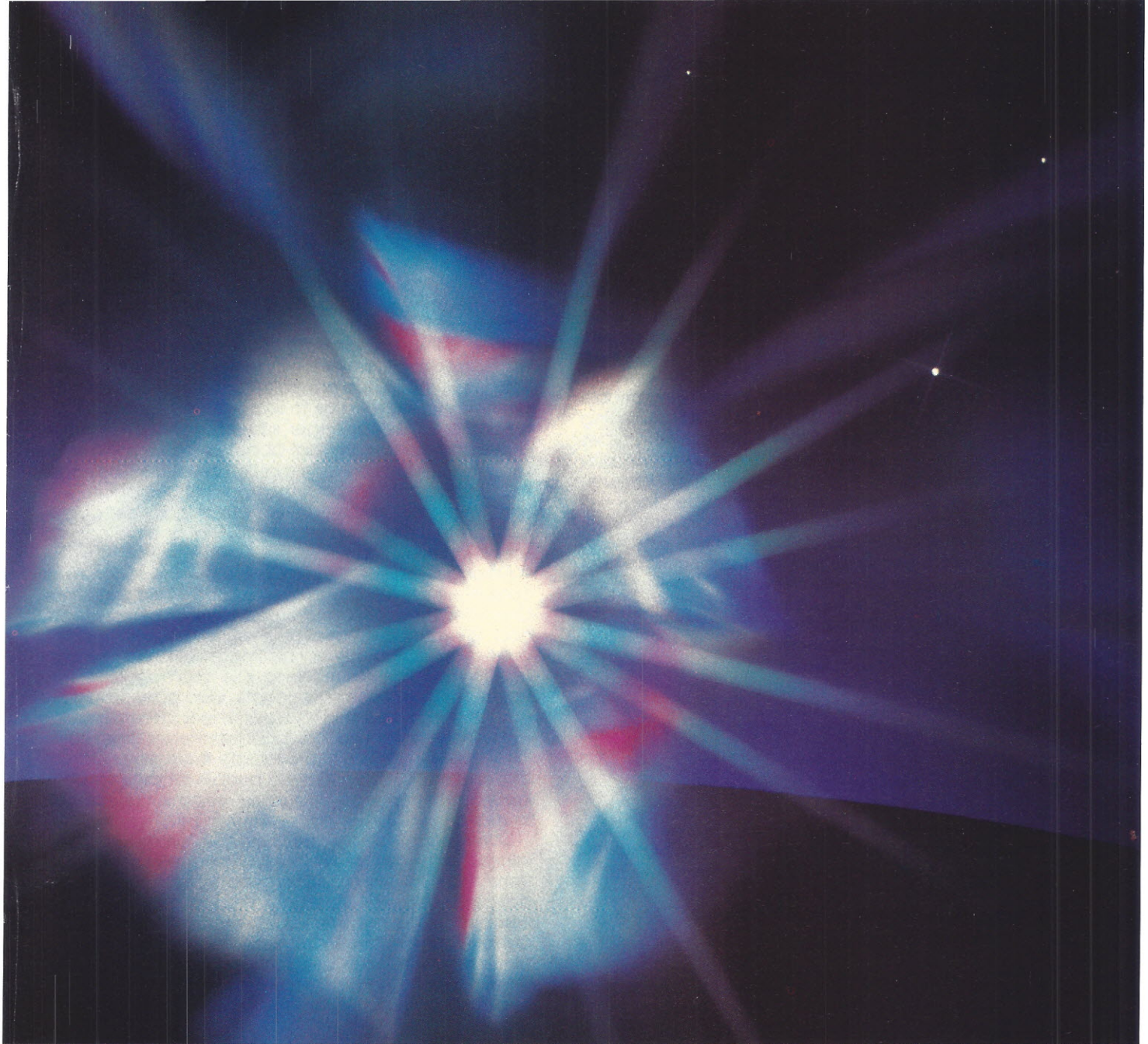
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Word Processor Training

When word processing is introduced into an office, the primary concerns are: Who will operate the computer? How will training be offered?

Whether present or prospective employees are familiar with word processing or have no exposure to the principles of computers, training will be required. The amount of time needed per employee will vary—so will the costs, according to the needs and how they are met.

During initial stages of system introduction, hiring people to use it can pose personnel problems. Word processing may be a prime example. Why? A person who types competently on standard typewriters may not readily adapt to the principles of computer operation. However, once people acquire computer aptitude, they will generally command higher salaries than entry-level typists. Even if they are not familiar with a particular system, they can generally pick up the peculiarities of another set-up and be more valuable than someone who is stymied by the unfamiliar commands.

We spoke with directors of computer training classes, corporate offices, small business offices, teachers and employees. The same problems and solutions surfaced and repeated during every interview with associated advantages and disadvantages.

There appear to be three approaches to training:

- 1) Teach word processing in the office by trained personnel.
- 2) Teach word processing in the office by consultants or teachers brought in as necessary (usually taught on a one-to-one basis or in a small class situation).
- 3) Send the employees out of the office to a class or tutorial environment.

Essentially, the first approach means that a new employee is trained in the use of the system by an employee who learned it from another employee.

The big advantage is that the trainer is always available to answer questions as they occur. The trainer, already familiar with the system and its uses, will train specifically for jobs indigenous to the work load.

However, one drawback is that the trainer may have to take time away from his own work load. Both employees may be distracted and interrupted so often that they become frustrated and irritable and fall behind in their work. The trainer may or may not be a good teacher.

If a company takes this route, the trainer should be evaluated for the ability to communicate. Special time should be set aside for uninterrupted training: perhaps an hour or two during the first two sessions, then less as needed. A careful monitoring should be kept of how well the trainee learns the work. Teaching time should be recorded so that future training time and costs involved can be established. If practical, extra funding might be established for training time in addition to an employee's established salary. The employee will function more conscientiously and not be unnerved about keeping up with his own work.

In a two-secretary office, where microcomputers were installed with a multiple-user system, the manager

learned to use WordStar (MicroPro, San Rafael, CA) thoroughly. He says, "I teach it because I can give the employee 10 or 15 commands that I know are necessary to begin working. I can check back every two hours. I'm always available for help."

We asked how this affected his own productive time. "In a month, I spend less than two hours with someone. By then, if they are ready for more esoteric commands, I can introduce them as they are needed. An employee who is self-motivated can refer to the manuals and the control reference cards to learn more procedures."

Another office manager says she analyzed procedures and discovered that about 20 basic commands were required to produce most office letters. She chose the Select word processing program (Select Information Systems, Kentfield, CA), which can be quickly self-taught using the on-screen tutorial and the easy-to-follow manual.

Among those interviewed, hiring outside teachers as consultants proved a viable route under some conditions. One company spokesman reported that her company had 20 machines available of one type: "Finding pre-trained people is almost impossible. We are constantly short of personnel, so it is impractical to free trained help to teach new people. Ideally, we would like consultants, but we don't have time to find them and too many incompetent people label themselves consultants. It is virtually impossible to evaluate them other than by trial and error. We have hired people for short sessions. It works if they're good. But frankly, we haven't been able to make it work the way we would like."

Contracting for outside help on an hourly basis eliminates the necessity of calling other personnel away from their jobs. Said one teacher: the one great advantage of in-office teaching is that only the subject that pertains to that office can be taught. If three or four people will be in one session, each should have a terminal. When two students share one terminal and one takes notes . . . the teaching takes twice as long and is really effective only for the person with fingers on the keyboard.

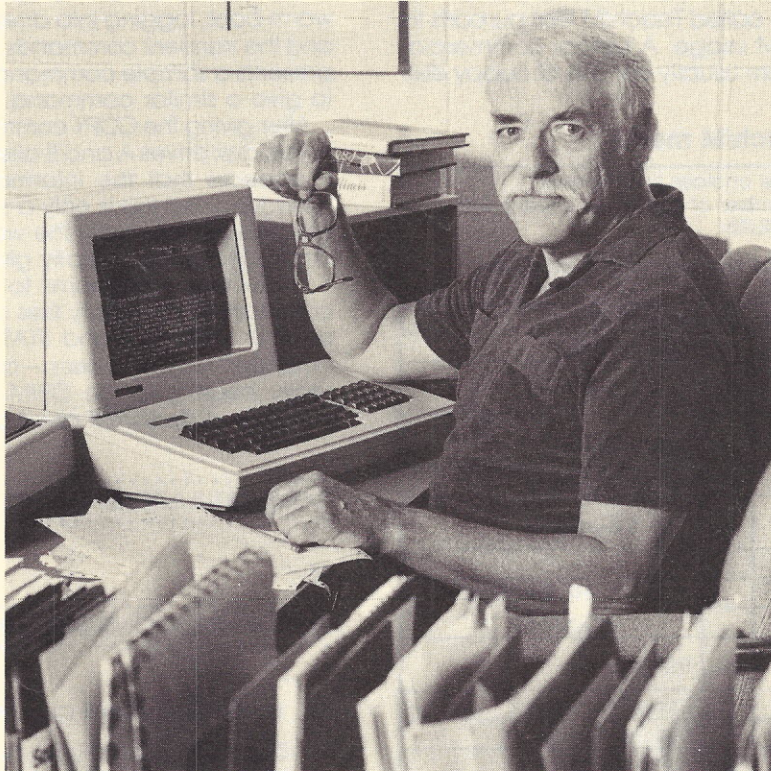
There are also some disadvantages. Finding qualified teachers for specific systems and arranging mutually-convenient times for teachers and employees were the most often-cited problems. In addition, some spokespeople said that two or three sessions may be required—four weeks apart. Trainees should be taught only enough required to do the basic jobs; only information that can be assimilated in one session. After familiarity with the basics is established, a later session can be scheduled to offer more complex routines as needed.

Hiring consultants to teach may sound easier than it is. The Datapro Research Corporation (Deltran, NJ) report on word processing suggests that a potential client request references from a consultant to appraise competency of the firm and the individual. Discussion should cover background, number of repeat clients, fees and fee structures. Some consultants charge a lump sum or a range of fees depending upon the assignment and number of people to be taught, plus other expenses. Always delineate—in writing—consultant's fees and the performance expected as accurately as possible.

Continued on page 126

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Teach/M

High-level computer languages such as Fortran and Cobol are pretty much the same from one type of computer to another. A program that runs on one machine will usually run on a very different one with little alteration. Unfortunately, operating systems are very different from one computer to the next—as different as Chinese is from English. Consequently, details of each operating system must be assimilated when moving from one computer to another.

Select Information Systems (Kentfield, CA) offers an ambitious CAI program called Teach/M that purports to teach elementary CP/M usage. A typical commercial CP/M computer program usually consists of floppy disk

Teach/M menu

DIRECTIONS: 1. Read the choices listed below. 2. Type number of section you want, then press RETURN.			
(NOTE—To leave TEACH/M just press RETURN.)			
1.	How TEACH/M Works	14.	How to ERASE
2.	What is CP/M?	15.	How to TYPE
3.	How to BOOT the system	16.	Using CTRL-S
4.	How to LOG onto a drive	17.	Using CTRL-P
5.	BUILT-IN Commands	18.	How to RENAME
6.	TRANSIENT Commands	19.	Error Messages
7.	How to INITIALIZE		
8.	How to COPY		** THE TEACH/M
9.	How to SYSGEN		SCENARIO **
10.	How to get a DIRectory	20.	The Situation
11.	How to PIP	21.	Using The Asterisk
12.	How to STAT	22.	Making Space
13.	CP/M names	23.	A PIP with a?

and user manual. Some manuals are better than others. Teach/M, however, has no manual at all—only a floppy disk and a single sheet of directions. A step not mentioned in the Teach/M literature is to make a backup of each new disk and put the original away in a safe place.

Teach/M is a comparatively large package—totalling 144K bytes. The main program has 22K and two auxiliary files consume 60K each. When executed, Teach/M begins by explaining the fundamental concepts of hardware, software, and operating systems. A sequence of 23 separate lessons are meant to be studied from beginning to end; however, it is possible to stop at any point and review a previous lesson or skip to a later one. It is also possible to exit the program at the end of a particular lesson, then resume Teach/M at the same place later. The accompanying figure illustrates the menu options.

Lesson 1 briefly explains the program organization. It then concludes with the options of:

Select one (C or E):

C — Continue with the program

E — Exit to the TEACH/M MENU

If the first option is chosen, lesson 2 then follows. Otherwise, the menu is presented so that a different lesson can be chosen. As the lessons become more complicated, there will be another option:

Select one:

G — Go back and try it again

C — Continue with the program

E — Exit to the TEACH/M MENU

The new alternative makes it easy to repeat the previous lesson.

The lessons cover the operations of cold boot and warm boot, logging into drive B, the built-in commands, and the transient commands. At each step, the program presents a sample command, then the student is asked to give a similar command.

After giving the COPY command, one might be terrified to see disk drives A and B alternately turning on and off. It appears that the information on drive B is being destroyed. But this is only a simulation mode. The disks are behaving exactly the way they would if the COPY command were actually given to CP/M.

In this way, one learns to use the DIR, STAT and PIP commands. Imaginary files are copied from drive A to drive B. When DIR and STAT commands are given, a simulated output is seen—as though commands had really been given to CP/M. After each command is completed, Teach/M gives a response such as:

```
*****
CONGRATULATIONS! YOU'VE LOGGED ONTO DRIVE B:
*****
```

or

```
*****
CONGRATULATIONS! BOY ARE YOU HOT!
*****
```

But, sometimes, there are messages like:

```
Don't worry. It isn't you. It's your fingers. You and I
both know what they were supposed to type:
STAT B: STAT.COM
```

or

```
Somehow, somewhere you went awry,
If I were in your shoes I'd give it another try.
```

The lessons continue with filename formation, use of control characters and meaning of BDOS error messages. The last four lessons are more complicated. For example, the Lesson 20, drive A has nine files that are to be copied to drive B using PIP. Furthermore, there are files already existing on drive B.

Increased confidence for operators

The use of the asterisk (*) as an ambiguous reference is introduced at this time. When the PIP command is given, disk drives A and B alternately turn on and off, as if they were really copying the files. During the simulated copy process, the file names are displayed

Continued on page 127

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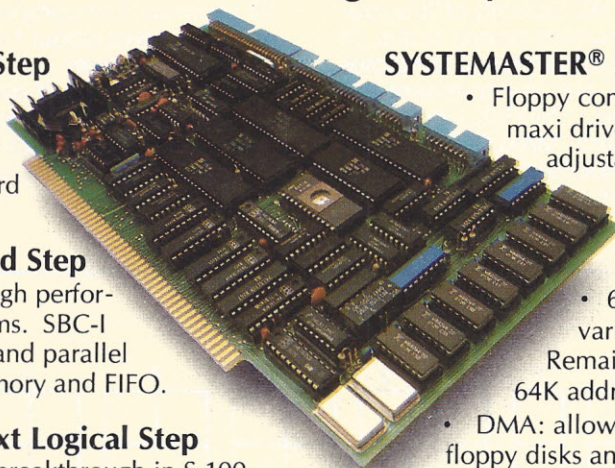
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- Parallel ports may be connected to Teletek's PSC board for RS-422 capability.



TELETEK

CIRCLE 90 ON INQUIRY CARD



Zebra III

This month's column will feature still another reader solution to our Zebra Problem Game (1A Mar 82). It was supplied by Roger C. Conant, Associate Professor, University of Illinois at Chicago Circle.

The search requires only 86 moves. The key is to conceive the problem as a board game, in which the statements given specify the shapes of the "pieces" that can be played, with the objective to play the pieces so that they do not collide on the board.

Imagine a 5-by-5 board in which the rows are labelled Nationality, Color, Animal, Drink and Cigarette, respectively. From statements 8, 9, and 14, three cells on this board can be filled immediately without cheating—(1,1) is the Norwegian, (2,2) is blue, and (4,3) is milk. The other statements can be thought of as templates of letters inscribed on rectangles of clear plastic, which must be overlaid on a board to solve the puzzle (see figure 1). A complication is that only one of the templates 8 and 9, and only one of 10 and 11 can be used. So a solution consists of a placement of the first 7, either 8 or 9, and either 10 or 11.

Now it is only necessary to move these templates across the board, trying for non-colliding positions, and doing it systematically. A short program for doing this is enclosed. It is written in the Sparks language, a variant of Fortran invented by Dr. Ellis Horowitz, which allows modern control structures. It could easily be translated into Basic, but is more readable as is.

The data matrices are as follows: LOC(PC) gives the current location of the template PC, actually of its upper left corner. MATRIX stores the current board status. (It proves convenient to visualize the movement as templates sliding across a square board, but to implement this board or matrix as a linear array.) NEXT(PC) gives the piece to try next if this PC succeeds. MAXLOC(PC) gives the largest starting location for template PC, corresponding to the upper left corner of the template being in column 4 for 5-by-2 templates and column 5 for 5-by-1 templates.

FAILPC(PC) gives the PC to move next if the current PC cannot be placed.

PATRN(PC,PART) contains the template information, giving increments from the upper left corner to the first filled square, from this to the second, etc. of each of the 11 templates. (Because artificial pieces 12 and 13 indicate success and failure, this matrix has 13 rows rather than 11—for the sake of computational efficiency.) LETTER(PC,PART) contains the numerical equivalents of

The search takes only a small fraction of a second...

the letters that should appear in the final printout, but don't because Fortran66 makes that more effort than it's worth.

The order in which the templates are tried can be varied and will have some effect on the efficiency of the search. We tried to avoid cheating by taking them in the order they appear in the problem statement, except trying simple templates before complex ones. The search takes only a small fraction of a second—quite an improvement over 788 years!

The Basic version, on a TRS-80 Model II, takes about 25 seconds. The compiled Fortran version on the same machine takes about 1/4 second. Sparks/Fortran version is 100 times faster.

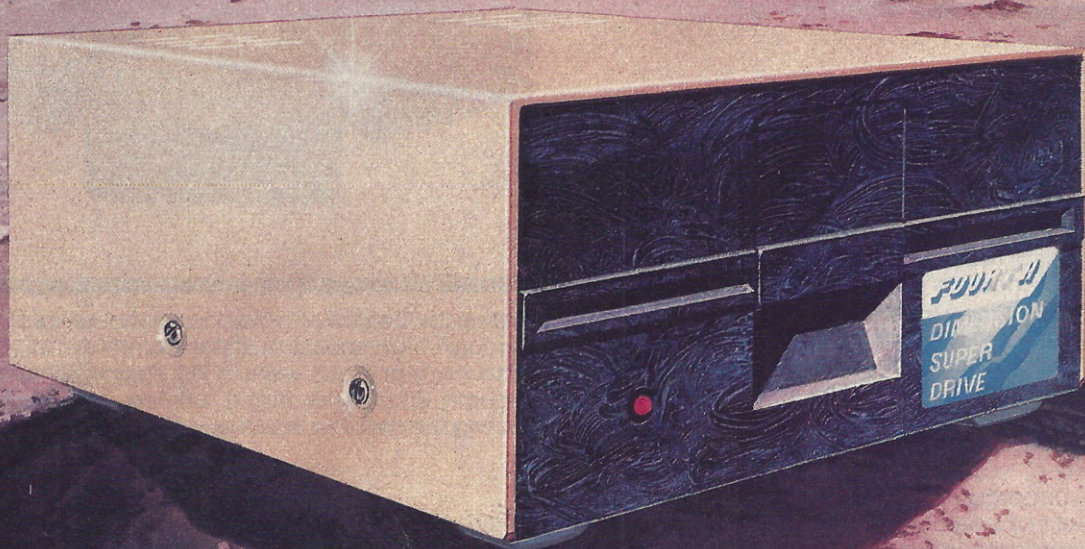
Incidentally, I had always wondered how inventors of such problems could do it, or could be sure that their problems had solutions. Viewing them as board games makes it easy to see how such problems can be constructed.

Continued on page 128

Template #	1	2	3	4	5	6	7	8	9	10	11
Nationality	E	S	U			J					
Color	R						I G			Y	Y
Animal		D		S				F	F	H	H
Drink			T		O		C				
Cigarette				O	L	P		C	C	K	K
Rule #							3 & 5	10		7 & 11	

Figure 1. The Templates

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Our popular "Power in your Pocket" column on handheld computer applications has been expanded to encompass reports on the latest developments in the fast-growing area of portable computers. This month's column initiates the new format with an interesting product introduction by Assistant Editor Dan W. Post, as well as a useful pocket computer program by Bob McElwain—ed.

Cost Estimation

Does your office need a coat of paint? What about a new carpet? With the accompanying estimator program for pocket computers (page 132), you can obtain a valid estimate of costs and guidance on material selection.

The program is in two parts. The first is based on areas, accumulating as many as are needed. Use this segment to estimate the cost of tiling or carpeting a floor, or to estimate the cost of a new roof. It can also be used to estimate the cost of painting the outside of your building or fertilizing your lawn. More than one cost can be accumulated. For example, when carpeting, you can include the cost of the carpet, then add the cost of a pad. In painting, you might want to include costs of preparation, undercoat, then final coat.

Once a total has been computed, it can be entered as a single rectangle of length (1) and a width equal to the total area. In this way, costs of different materials can be quickly estimated on subsequent runs.

The second segment is designed to estimate the cost of materials for painting the interior. This segment also accumulates areas, but areas for doors and windows (areas not to be painted) are subtracted from the area of wall surfaces. Further, door and trim areas are accumulated.

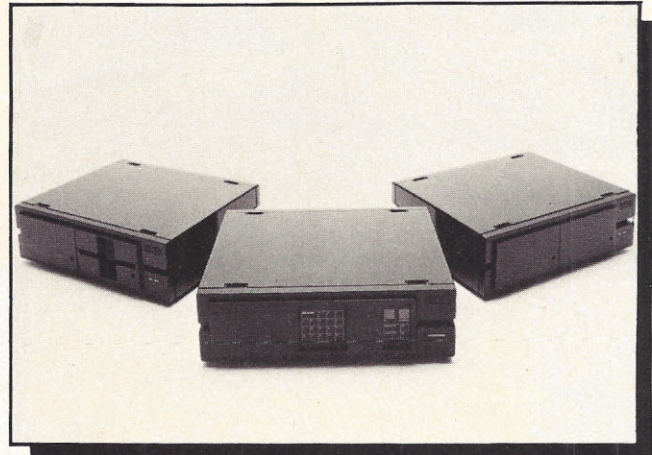
Any businessman with a frequent need for estimating may find this program a suitable model for building his own program. The concept has a wide variety of applications. The program takes on a whole new look if quantity is substituted for area. □

Contributing editor Bob McElwain is a graduate of Pepperdine College with an MA in Mathematics from Boston College. He works with Los Angeles City Schools as a computer science instructor, and as a software consultant for business and industry. He's the owner of Hanco Software, specialists in software for handheld computers.

The Navigator

The Navigator System (Grid Systems, Mountain View, CA) comprised of the Compass Computer, Compass Central, Grid Central and associated software and communications capabilities may represent a new generation of advanced system architecture. It uses a unique personal computer; an integrated set of software; a host of peripherals, and a supporting network of IBM Series/1 computers.

Measuring 11½-in. by 15-in. by 2-in. and contained in a magnesium case, the 16-bit 8086 and 80-bit 8087 microprocessor-based Compass Computer provides 256K bytes of RAM and 256K bytes of fixed bubble memory. The computer contains a battery-powered real-time



Compass Central provides local in-house support services through high-speed multiple communications ports. It can link numerous users to the floppy/Winchester (left), double Winchester (right), printers and plotters, eliminating the need for each user to have a dedicated unit.

clock-calendar. The unit opens to a 57-key keyboard and a 4¾-in. by 3½-in. bit-mapped flap-panel display.

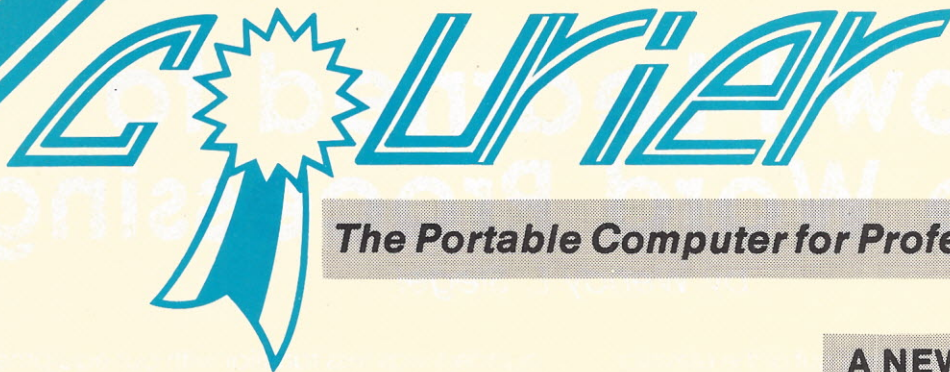
It features a built-in 1200/300-baud full-duplex Bell-compatible (212a/103a) modem that provides auto-dial and auto-answer operation. The first of two modular jacks at the back of the unit provides direct connection to the public telephone system for voice or data transmission. The second modular jack is for a telephone handset, which allows the system to be used as a power-assisted telephone for voice communications. The initial set of terminal emulators include the IBM 3101, 2780, 3780, 3741, 3275, and 2770, as well as the standard Teletype.

The system uses a single-user operating system with full multi-tasking capability and dynamic task management. A UNIX-like file system allows files to shrink and expand dynamically without preallocation. With dynamic memory management, run-time relocatable programs can be run at any time in any available memory. All programs are menu-driven, and 14 to 18 commands are common to all applications software. The 18 commands are modeless and go to the function directly, eliminating the need to branch through separate menus and sub-menus.

A bit-mapped, flat-panel display measuring 4¾-in. by 3½-in. can produce characters with charts and graphs. A matrix density of 320 by 240 dots produces amber images. The screen can display as many as 24 lines and up to 70 proportionally-spaced characters. Wider data formats can be viewed by scrolling, which extends the width of the text to as many as 256 characters. When handling columnar data, as many as 256 columns of varying widths can be created.

Software development tools available with the system include an editor, macro assembler, and five languages: Pascal, Fortran 77, PL/M, C, and MicroSoft-compatible Basic. All languages are compatible, and a linker utility allows programmers to unite programs written in different languages. A symbolic debugger helps speed program

Continued on page 132



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How I Learned to Love Word Processing

by Wendy L. Siegel

Returning from lunch, I stepped out of the elevator, and fought through an uncharacteristic crowd to my office. What was happening? What was everyone looking at? As I shoved to the front of the group, I could see huge boxes scattered everywhere, and in their midst, a well-dressed young man quietly laboring to pull out the contents. Our word processors had arrived at last.

Delivery had come only a few weeks after order date, but company preparation had been at least three times as long. Needs assessment, feasibility studies, committee meetings and memo writing had been extensive. After so many preliminary hours devoted to the word processing concept, we couldn't wait to actually get the equipment in hand.

Even with so much conscientious thought devoted to this application, no one foresaw the sea of confusion that would engulf us for two long months.

Utopia vanished as soon as the installer stood up, brushed off his pants and put on his top coat. "OK, folks, here're the training instructions." He then dumped seven notebooks full of lessons and 12 cassette tapes on my lap! Every bit of this had to be assimilated before operation could commence.

"Wait, what about the personal instruction we were promised?" I cried in despair. "That's it, lady. We stopped our formal training program because this works out much better."

Do you know what it's like to teach yourself a whole new language and an unfamiliar technology while the boss is complaining that regular duties are being neglected? Meanwhile, another manager keeps breathing down your neck chanting, "Will you be able to do this 150-page report Monday?"

The marketing salesman had told us that learning to use the equipment would be a breeze. "Why, my wife,—who's just a high school graduate—was doing my business reports after only two hours on the machine. It was a snap. She loves it." Well, I'd love to meet his wife in a dark alley someday. Why did I have to stay late after work, then go home and read through the manual until midnight every night for weeks? Why didn't he tell me what would happen to my ego—much less my social life?

The sales office had the audacity to give us a toll-free phone number to use whenever we had trouble—unlimited phone calls for three months. Big deal; we spent \$35,000 and the bonus is a couple of phone calls. Actually, in the showroom we assumed that phone calls direct to headquarters would be great—until we found out that head-

quarters was less familiar with our equipment than we were. "It's a brand new machine," they'd answer, "so we're not totally familiar with the manual."

That's certainly one point I could agree with. No one could possibly be familiar with that manual—certainly not the author. Could they have given us an encoded version and neglected to tell us? That could be the only answer.

When we finally started typing research reports, we realized how different our expectations were from reality. The showroom demonstration indicated that "cut and paste" could be accomplished with the blink of an eye. That's just not the case with documents of substantial size. The agony of waiting as the machine hunts, line by line, for a single insertion point cannot be overstated.

I couldn't wait to use the form-letter generating feature. No more retyping a letter over and over. No more worrying about typing mistakes. In the time that it took to figure out how to do the program, then stand over the machine inserting stationary, I could have done it several times manually.

Utopia did eventually arrive. We thought it would be immediate, but it took a few months—we needed a period of adjustment and learning. Now that we're comfortable using the equipment, we've developed all sorts of shortcuts—we're constantly devising new work to do on the word processor. We use it all the time; we can't pry some of our staff away. The problems we had in the beginning have all disappeared and word processing has essentially proven to be everything we had hoped for. The terminals have now replaced the water cooler as a gathering place. But with a difference; we congregate to instruct, compare and learn, not gossip. Many of us have come to feel that our lengthy period of initiation could have been avoided if we had not based our product decision almost exclusively on a showroom demonstration. Our advice is to try out a variety of equipment—actually sit at a terminal and do some typical work. With this approach, you'll be more likely to find the machine and dealer support best suited to your needs. Chances are you'll become adept faster than we did. □

Wendy L. Siegel is director of word processing for a nonprofit research and demonstration agency in Philadelphia, PA. She is the author of several internal office training documents.

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CIRCLE 32 ON INQUIRY CARD

CB-80 for CP/M: A Compiling Version of CBasic

by Alan R. Miller

A true compiling version of CBasic, called CB-80, has been introduced by Digital Research (Pacific Grove, CA). It shares most of the features of CBasic, but has a few important differences. The most important difference is that programs generally run much faster. Furthermore, labels used for branching can be regular alphanumeric symbols as well as numbers.

The Basic language has matured greatly since the early days of computers. The first versions were extremely limited—variables had to be a single letter or a letter followed by a decimal digit. Furthermore, editing of the source program was difficult.

Microsoft (Bellevue, WA) led the way to a more powerful Basic by adding many desirable features. The current version 5 includes such things as long variable names, a line editor, the typing of variables (as integer, double precision, and string), and the WHILE/WEND construction.

Offering a readable program

CBasic (JA Sep 1981) is another interesting variation of Basic originally developed by Compiler Systems; this company is now a part of Digital Research. CBasic and the Microsoft versions allow variable names to be as long as 31 characters. Thus, Basic source programs can be much more readable. In addition, CBasic allows a decimal point to be embedded within a symbol for additional clarity. For example, symbols such as INCOME.1981, VENDORS.1982 and MARCH.PAYROLL are valid.

Basic programs usually require a number at the beginning of each line. These are typically used to sequence the statements of the Basic source program. In addition, these numbers are used for

branching. For example, there might be a Basic statement such as

GOTO 75

When this statement is encountered, the normal program flow is interrupted. Execution then continues at line number 75.

CBasic does not require numbers on each line. They are only needed as labels for branching. Unnecessary line numbers are flagged by the compiler as non-fatal errors, so that they can be removed. Unneeded line numbers are nonetheless tolerated, and regular Basic programs can be run with the CBasic compiler.

Basic is often implemented as an interpreter. During execution, each statement of the source program is interpreted every time it is encountered. The compiler generates a relocatable file, which is then converted with a linking loader into an executable module.

Compiled programs typically run many times faster than interpreted programs. The compiler generates a relocatable file, which is then converted with a linking loader into an executable module. However, compiled programs are more difficult to develop. With an interpreted program, execution can be stopped at any point. The current values of the variables can be printed out or changed. Program execution can then be resumed.

Microsoft's MBasic is implemented as an interpreter. However, there is also a compiling Basic called Bascom (JA Jul 80), which runs Basic programs considerably faster. By contrast, CBasic is usually classified as an interpreter/compiler or as a pseudo-compiler. The original source program is converted into an intermediate file subsequently interpreted by a run time monitor.

The major advantages of CBasic are 14-digit BCB arithmetic, long variable names, and freedom

from line numbers. The compiling step removes comments and compresses long variable names; there is no speed penalty for using these features. With CB-80, the command

```
GOSUB SORT.ROUTINE
```

can be used to call a sorting subroutine.

A CB-80 source program is generated with a system editor such as WordStar (MicroPro, San Rafael, CA). The program is compiled into a REL file using the CB-80 compiler. If syntax errors are discovered during the compiling step, the system editor is used to fix the program.

After the source program has been successfully compiled, it is converted into a COM file with the linking loader LK-80. In addition to CB-80 and LK-80, it is also necessary to have several other programs. These include CB80.OV1, CB80.OV2, CB80.OV3, and CB80.IRL. The resulting COM file, which is somewhat smaller than a comparable Bascom COM file, can be directly executed.

CB-80 incorporates several options, called toggles, that can be given on the command line at compile time. Some toggles can be used to control the printing of the source program and the generation of various modules. One of the most important toggles will mark undeclared variables. This feature can help find errors in the source program. Like other Basics, CB-80 does not require the declaration of variables. However, the U toggle can override this feature.

Suppose that the variable I3% is to be used as a loop counter. Furthermore, assume the value of another variable, say FEB.WITHHOLDING, is to be based on the value of the loop counter. The programmer meant to write

```
FEB.WITHHOLDING = I3%
```

but instead wrote

```
FEB.WITHHOLDING = J3%
```

If J3% has never been defined, its value will be zero.

All CB-80 variables can be declared at the beginning of the source program. There might be a statement such as

```
INTEGER I3
```

```
REAL FEB.WITHHOLDING
```

defining the variables. If the U toggle is chosen at compile time, J3 will be flagged as an undefined variable in the above example.

The execution speed of business-oriented computer programs is typically limited by printer capability. Consequently, results of the usual benchmark programs may not be directly applicable. The ease of writing, debugging and

maintaining programs may be more important. Nevertheless, several simple tests were made.

Three different tasks were used to compare the operational speed of CB-80 to CBasic, MBasic and Bascom. Sorting is a common computer activity. Consequently, two different sorting routines were

An advantage of Basic over engineering languages is string handling

tried. In the first test, a real array was filled with 400 values from the built-in random number generator. The elements were then sorted with a Shell-Metzner algorithm. In the second test, 200 strings of names and addresses were sorted with the same algorithm. In the third test, sets of Hilbert matrices were solved using the Gauss-Jordan elimination method. This third phase presented a severe test of the floating-point operations.

The CBasic and MBasic interpreters performed both sorting tasks in about the same times. As expected, the compiling Basics were much faster, with Bascom showing slightly better time than CB-80.

One of the advantages that Basic has over other engineering languages is ease of string handling. However, there is a potential problem with CBasic and CB-80. If you ask either of Microsoft's Basics to sort the three strings APPLE, CAT, and DOG, you will get the expected result of

```
APPLE  
CAT  
DOG
```

However, if you try to sort these three strings with either CBasic or CB-80, you may be surprised to find that DOG comes between CAT and APPLE. That is, the sorted list will look like this

```
CAT  
DOG  
APPLE
```

APPLE is a longer word than the others and CBasic and CB-80 sort shorter strings before longer ones. However, if each string is filled out with blanks on the right until all strings have the same length, CBasic and CB-80 will give the expected result.

The CBasic program given in listing 1 will properly sort a disk file of strings using the Shell-Metzner method. The original file is read into memory. If necessary, shorter strings are blocked out to the length of the longest member. The strings are then sorted and written to a new disk file. The two different

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CIRCLE 7 ON INQUIRY CARD

forms of the IF...THEN statements are evident in the listing.

The solution to a Hilbert matrix is a multidimensional analogue to the problem of finding the intersection of two nearly parallel lines. It involves a concept known as ill conditioning. The problem begins with a 2-by-2 matrix that has the exact solution of 1,1. Then a 3-by-3 matrix is solved. It has the exact solution of 1,1,1. The matrix is increased in this way until an 8-by-8 matrix is obtained.

If floating-point operations are performed to 6-significant figures, the answer will be in error by about 6% for a 6-by-6 matrix and will be meaningless for an 8-by-8 matrix. However, if floating-point arithmetic is carried out to 14 figures, the solution will be accurate to better than 6 significant figures.

The Microsoft Basics normally use six-figure precision. However all real variables were declared to be double precision for this test. CBasic and CB-80 always use 14-figure precision. Integers were used for all loop counter variables. The results from this test showed that all four Basics performed very well. The solution to an 8-by-8 matrix was accurate to more than six figures for all of the Basics.

These three tests gave the expected results. The interpretive Basics—MBasic and CBasic—are slower than the compiling Basics—Bascom and CB-80. The floating-point precision was equivalent when double-precision variables were used for Microsoft Basics.

Another feature of CB-80 can be used to implement a password. Normally, whatever the user types on the console is displayed (echoed) on the screen. However, there are times when the echoing of characters is undesirable. The INKEY function can be used in this case. The program given in listing 2 shows how this can be done. When the program is executed, it prints the prompt

Account name:

and waits for user input. This response is echoed on the console, since it is obtained with the INPUT function. The program then displays the prompt

Password:

This time, the keyboard characters are read with the INKEY function and do not appear on the screen. The individual characters are converted into a string called PASS.WORDS. This phase is terminated when a carriage return is typed. In this example, the program recycles so you can try it again. In a more typical application, the resulting string could be compared to a list of authorized passwords. The program could be terminated if an incorrect password was entered, but could continue otherwise.

There appears to be an inconsistency in the way CB-80 interprets alphanumeric labels. The expression

```
IF I% = 10 THEN 1000
```

will cause a branch to line number 1000 if the logical expression $I\% = 10$ is true. CB-80 will also accept an alphanumeric label in place of the 1000. However, sometimes the expression

```
IF I% = 10 THEN TOO.BIG
```

will compile correctly, and other times it generates an error message. In this latter case, the expression

```
IF I% = 10 THEN GOTO TOO.BIG
```

can be used instead. On the other hand, sometimes this latter form will generate a compiler error, but the previous two forms will not. Digital Research is aware of this problem—it may be fixed by the time you read this review.

CB-80, like its CBasic counterpart, incorporates a wealth of features. These are reasonably well covered in the 146-page user manual. There are several compiler directives similar to those provided with assemblers. These commands begin with a % symbol. For example, a %LIST and %NOLIST can be used to selectively skip the printing of parts of the program during compiling. The %EJECT command begins a new page and the %PAGE command sets the desired page number.

The %INCLUDE directive is very useful. It tells the compiler to temporarily stop processing the current program and go to the named disk file. The statements in this file are processed as though they were actually included in the original computer program. At the end of this disk file, processing resumes with the original file.

With this mechanism, it is possible to keep frequently used subroutines in separate disk files. Thus it is not necessary to place a separate copy in each program that needs the routine. The INCLUDE feature is also offered on Microsoft Basics. However, it is much more useful with CBasic and CB-80, since line numbers can be omitted from these routines.

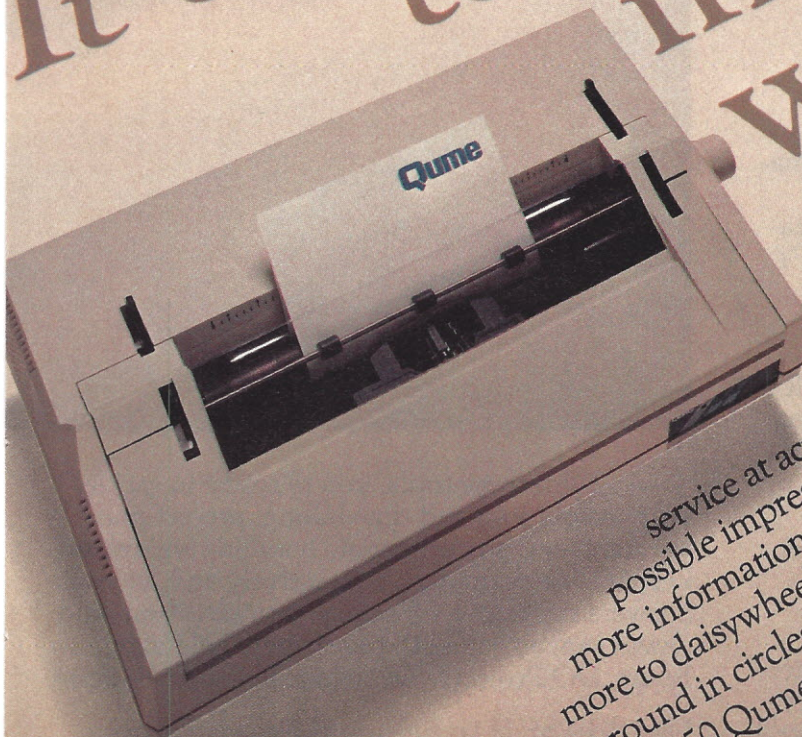
There was a time when a steep royalty fee was required from authors selling programs generated with CB-80. That requirement has been dropped; now it is only necessary to acknowledge the Digital Research copyright. If you are currently using CBasic, a switch over to CB-80 will provide faster execution. If you are using another derivative of Basic, you may want to evaluate CB-80 with regard to your individual needs.

Contributing editor Alan R. Miller is a Professor at New Mexico Institute of Mining and Technology, where he has taught materials engineering, thermodynamics, and programming methods since 1967. He received his Ph.D. from the University of California in Berkeley. He has authored five books dealing with computer languages.

Program on page 166

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Link Systems' DataFax

by Carl Heintz, CPA

DataFax (Link Systems, Santa Monica, CA) is unique in that it produces a truly free-form database. The program is designed for the Apple computer with at least two disk drives. The program is written in Pascal. The Apple must be configured for 16 sector drives and have 64K bytes of RAM. This necessitates installation of one of the many 16K boards available. Any variety of printer that functions with the Apple is acceptable. The system also allows use of an 80-column card and hard disk or 8-in. disk drives—as long as those devices are configured for Apple Pascal.

DataFax is invoked by placing the diskette in the machine and booting the computer. The first screen display is a general menu providing the following options: Open an existing database; Set up a new database; Back up a diskette; Format a Blank diskette; Toggle printer line feed; Quit DataFax.

The first logical selection is to format a blank diskette. This option yields the choice: "which volume 4,5,9 or 12?" To the uninitiated in Pascal, that question is a bit disconcerting—after all there are probably only two disk drives. Assuming that the user reads the instructions, though, all is clear—volume 5 is the one you want. For some obscure reason, perhaps known only to the original programmer, Pascal labels the disks by "volume" numbers, which have no relation to reality or logic. Assuming that the user has read the instructions and indicates 5 for disk II, the program proceeds to format the disk. Upon completion, it asks for another disk or gives the classic "That's all folks" message and returns to what appears to be choice 2—setting up a new database option.

There's only one drawback to the formatting routine—ideally it should provide the user with an indication of existing content before erasing and reformatting the whole thing.

Assuming the choice is made to open an existing database, the first question asked is what volume is desired. The programmers apparently anticipated less-than-proficient users, and have included a suggested answer (5), to which the user merely hits the return key if in agreement. If no database exists

on the file, the program notes this and returns to the main menu.

Setting up a database is an interesting task. The user is given the option of establishing the size of the file in blocks (274 suggested). The program then types little dots as it takes the diskette and writes out fixed length records of 274 bytes over the entire diskette. The process consumes about a minute. When complete, the diskette represents a database.

Separations of data

DataFax is unique in that each diskette represents one database—and only one database. The entire diskette is called a volume, and each record within this one giant file is called a "folder." Sure enough, the system works just like a large traditional filing cabinet.

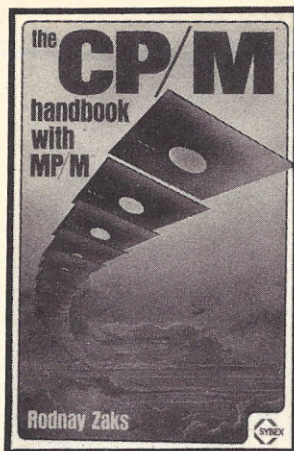
Upon initialization, the system presents the main processing menu, which contains the following options in a one-line list across the top of the screen: New, Examine, Scan, Print, Delete, Keys.

These commands are invoked by their first letters. "New" means just that—the user is entering fresh information and will basically open a new folder in the file. Upon entering this command, the top menu disappears, the cursors (yes there are *two*) clear the screen and a bottom line informs the user that he is on page 1 of 1, wordwrap is on, and there are no keys. Data may then be entered on a blank screen.

To do this, DataFax includes an editor—much like an ordinary text editor. It has all of the expected commands, including cursor movement, tabbing, line or characters insertion or deletion, and either line or screen erasure. It also has a command for keyword specification—upon which the data is filed.

Keys are of fundamental importance to the DataFax system. They can be best thought of as

Continued on page 136



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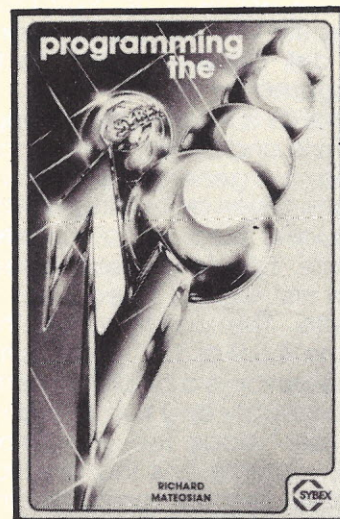
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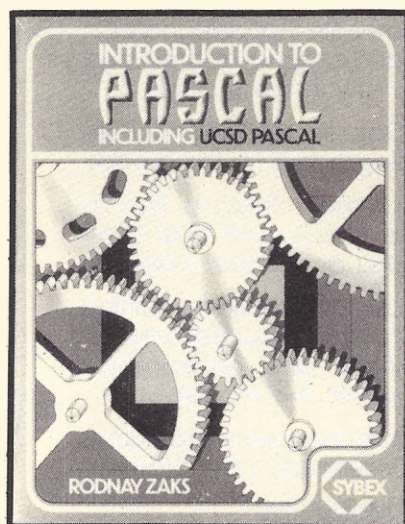
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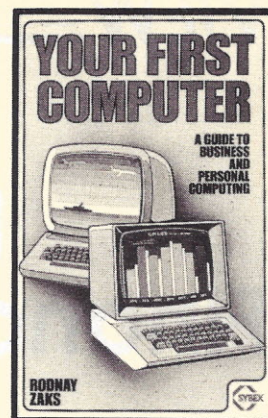
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MicroFinesse: A Financial Modeling Program

by Robert Moskowitz

Reading the end user agreement accompanying the MicroFinesse financial modeling system provides a subtle lesson. The first paragraph tells one that the agreement is between P-E Consulting Group, Osborne/McGraw-Hill (Berkeley, CA), and the end user "who wishes to register as provided hereunder to obtain the benefits set forth below." Nothing in the ensuing document has anything to do with registering, nor reveals any benefits for the end user. The agreement virtually ignores the needs and desires of any end user in favor of protecting the suppliers.

The program is derived from Finesse, a mainframe financial modeling system originally developed in England for the P-E Consulting Group during the early 1970s. Robin Hill Systems, Ltd., partners of P-E, converted the program to the Pascal language in 1981 and made it run on a 64K-byte Apple II. Osborne/McGraw Hill signed on as the U.S. distributor.

MicroFinesse itself, with a Proprietary Software Protection Device (called simply a "hardware key" in low-priced parlance) lists for \$495. Pascal and a second drive are also needed.

MicroFinesse comes on four mini-floppy disks—a Program disk, a Model Master disk, a Graphics disk and a Demonstration disk. Before you can run the program, you must pop the cover off your Apple and insert the hardware key into the Game I/O. The next step is to make copies of the first three of these disks, then transfer onto these copies three programs (APPLE1:SYSTEM.SYNTAX, APPLE1:SYSTEM.EDITOR, and APPLE2:SYSTEM.COMPIILER) from the Pascal disks. Then you make three new copies of these copies to use as working disks and store the originals and the first set of copies away as back-ups. This installation procedure is a formidable task for novices.

Despite the quantity of disks, not much disk-switching is required during actual operation. Most of the time, you operate with the Program disk and a model data disk. The Model Master is needed only for setting up new, previously initialized data disks—one for each financial model. The Graphics disk is needed to access any but the simplest graphing functions.

MicroFinesse does its modeling by taking values in a data file, installing them in a structure described in a "model" file, acting upon this set-up in accordance with a separate logic file, then printing out the results in a report file. A model is built by using

an Editor program to enter the information for each file in turn. The process is complicated by the need to know almost exactly what you want before you begin.

The recommended procedure for working with MicroFinesse involves:

- 1) Conceptualizing the modeling situation.
- 2) Defining the number of rows and columns needed. (Unneeded rows slow down the processing and packing the matrix too tight makes it hard to expand or improve the model later.)
- 3) Setting up a Names file that designates a name, number and optional abbreviated name for each row in the model.
- 4) Inputting to the Data file the known values desired as starting points for the model.
- 5) Creating one or more Reports files to specify both the layouts and final computations needed as printed output.
- 6) Setting up the actual Model file containing the formulas for each calculated row, as well as references and relationships between rows within the model.
- 7) Checking to ensure the rows and columns are properly referenced in the formulas.
- 8) Compiling the Model file.
- 9) Running the model on simple data to check for logical errors. For example, pay periods mistakenly divided by gross salary instead of vice versa to determine amount of pay per period will yield incorrect output. No amount of error-checking—by any modeling program—will find the source of this problem on more complex data.

The program includes some valuable features and capabilities. The acceptance of Pascal for its logic file provides substantial programming power, and makes it relatively easy to develop models that handle complex functions.

MicroFinesse also has potential for error trapping. The IF . . THEN . . ELSE command can be used to have

the model check for possible errors such as out-of-limits variables or division by zero.

Once satisfied with a Model file, it must be compiled before it can be used. The compiler provides a significant amount of automatic error checking, mainly on Pascal syntax. If the computer detects an error, it prompts you. A single keystroke will put you back in the Editor mode, with the Model file loaded and the cursor positioned at the point of the error.

The models developed with MicroFinesse are capable of partial runs and extensive data changes. The results are usually calculated column-by-column from left to right, with the runtime display revealing which column is being processed at any given moment. A simple command sequence permits one to exclude any number of columns from normal processing in order to speed up the calculation delay or see how just one part of the model responds to special data inputs.

The results of multiple model runs—even on separate models—can be accumulated into a single, comprehensive file that can be printed or displayed graphically either with or without additional calculations. This means, for example, that separate models could be established for each of several product lines or departments within an organization; then results can be accumulated to create a picture of total performance.

The notable features of the program include a built-in Sensitivity Analysis System, and a special Target Analysis capability. MicroFinesse allows one to set up any row for automatic progression of values. The starting, step, and ending changes can be specified in terms of percentages of the existing values. In addition, any other portion of the model can be displayed to see the results of these changes. This enables modification of one element in the model systematically and the opportunity to view how other portions of the model react to the progression of changes.

This sensitivity system can vary only one row at a time, so if many rows for a given model are to be affected simultaneously, the pattern must be pre-planned. The basic technique is to include in the formulas the value of a separate row set up specifically to act as a lever on the ones to be modified. Varying the lever row will then change the calculated results on every row that is tied into it.

The Target Analysis capability is a kind of backwards calculation feature allowing one to specify the output results to be seen, then causing the computer to calculate the input variables required to achieve those results. Most financial models can be useful in both directions but normally run only in one.

Most of the command sequences are provided with prompts in a friendly tone. For example, during

Continued on page 50

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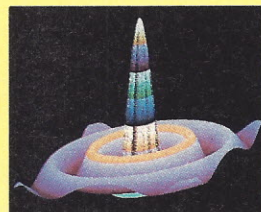
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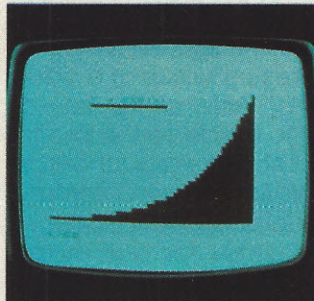
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MicroFinesse

Continued from page 47

the special Target Analysis sequence, the computer tells you:

"TRYING FOR <your value> AT ROW X COL Y
SO FAR XX.XX% CHANGE GIVES <current value>".

The program also provides some special financial calculations, including Net Present Value of a cash flow stream and the Internal Rate of Return—a popular and accurate way to measure the profitability of a given investment. Other special functions include Allowances, Depreciation, screen prompts for input, rounding and various tax calculations.

The Graphics function provides for automatic determination of the ranges to be used, and will automatically draw graphs, histograms, or pie charts. These prepared graphic slides are saved on a dedicated disk that holds 16 different ones. MicroFinesse can be programmed to display the slides in any order, and to retain each one on the screen for any pre-selected period. This enables slide shows of financial data.

MicroFinesse has a few other benefits. For example, once a Names file is established, data entry is comparatively automatic. The program

provides "forms entry" cursor jumps, plus other automatic features, including interpolation of values, and value allocation—where some parameters are given and the program calculates and provides the appropriate data entries for each place in an entire row.

Various prepared headings are available for models and reports, including integer values with automatic incrementation, months, quarters, and letters in alphabet sequence.

A full range of mathematical and logical operators are provided, including *, /, +, - (performed in this order), and =, <>, <, >, <=, >= to be used with IF...THEN...ELSE. In addition, various functions used in the model will cause the program to prompt for data at runtime, monitor the input for limits and defaults, and use the input in subsequent calculations.

Despite all its capabilities, MicroFinesse falls short of perfection. While some limitations may be unimportant to certain users, others will feel seriously hampered.

One irritating feature is the eight-character limitation on file names. This is too short for trustworthy

Continued on page 137

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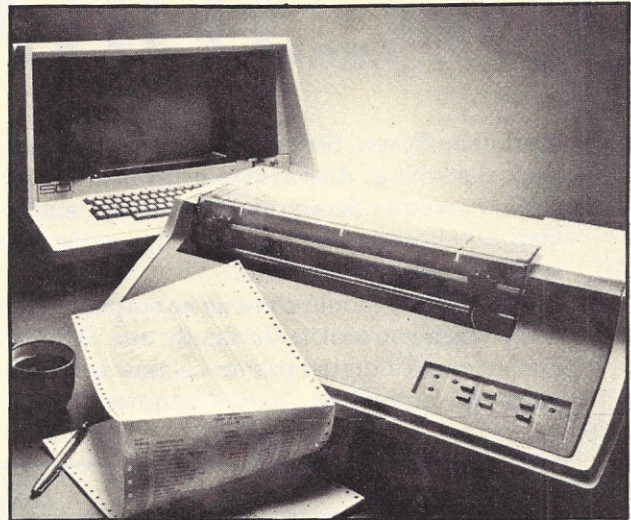
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Assignment: Benchmark

SD-200: Expandable Storage for System Growth



	C-3 Accounts Receivable Time (min.)	Current Price	to be covered in future issues
SD Systems SD-200	6:16.4	\$12,300	Commodore CBM-8032
Billings BC-12 DF2M	5:09.2	\$12,395	Smoke Signal Chieftan
Dynabyte 5300	4:38.0	\$ 7,735	Vector Graphic 3005
NEC Astra	5:10.8	\$ 9,890	Xerox 820
Altos ACS8000-15	10:41.5	\$ 9,875	IBM Personal Computer
Wang 2200SVP	2:23.0	\$14,600	IBM 5120
Pertec PCC 2000	6:04.3	\$12,470	
North Star Horizon	1:57.7	\$ 6,911	
Cromemco System Two	2:48.0	\$ 9,275	
Texas Instruments 771	3:38.1	\$12,100	
Vector Graphic System B	5:56.5	\$ 8,995	
DECstation 78	4:21.5	\$10,495	
Radio Shack TRS-80 model II	3:38.6	\$ 7,609	
Apple II+	6:17.4	\$ 4,330	
Digital Microsystems DSC-2	3:28.8	\$ 9,015	
Ohio Scientific C3-A	15:49.3	\$10,940	
Alpha Micro AM-1011	3:25.3	\$15,605	
Data General CS/10 model C1	2:40.3*	\$13,400	

*Time obtained using hard disk

Benchmark comparison

by Hillel Segal

Primary features of the SD-200 by SD Systems (Dallas, TX) are expandable memory and disk storage capacity and an affinity for popular operating systems. This system permits simple expansion from one to five users. Fast growing businesses computerizing for the first time will find that flexibility important.

The company offers four different models, all based on the same Z80 processor. The SD-200 is positioned next to the entry-level model, the MS-20. It can be expanded by adding memory and disk storage, and converted to multi-terminal use via the appropriate operating system.

While not a widely-known manufacturer of complete systems, SD Systems has about 60 dealers nationwide and also sells its processor modules separately. The firm says more than 25,000 modules have been sold, primarily for use in transaction processing systems. It is a division of Syntech, which uses the SD Systems equipment in its own transaction-processing business.

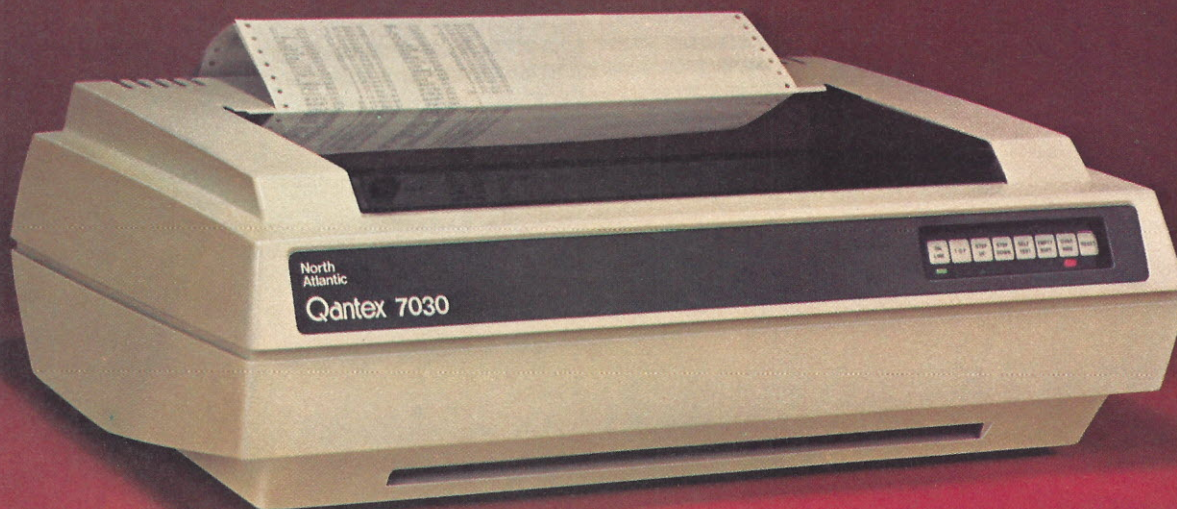
Our review of the system is based on the results of benchmark tests conducted by the University of Colorado's Business Research Division, under contract to the Association of Computer Users (Boulder, CO). The bench-

mark team runs a number of standard programs on the computers, timing each run. In this column, we're reporting the results of the accounts receivable program, which creates and updates a hypothetical set of business records—then displays the updated file. The program uses both disk and memory operations, and is a fairly good overall indication of system speed in a practical application.

Of course, we caution readers not to base their opinion of a system solely on the results of benchmark tests—either our own or those of other

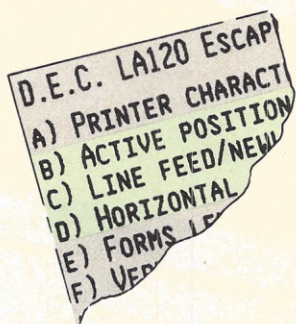
Continued on page 59

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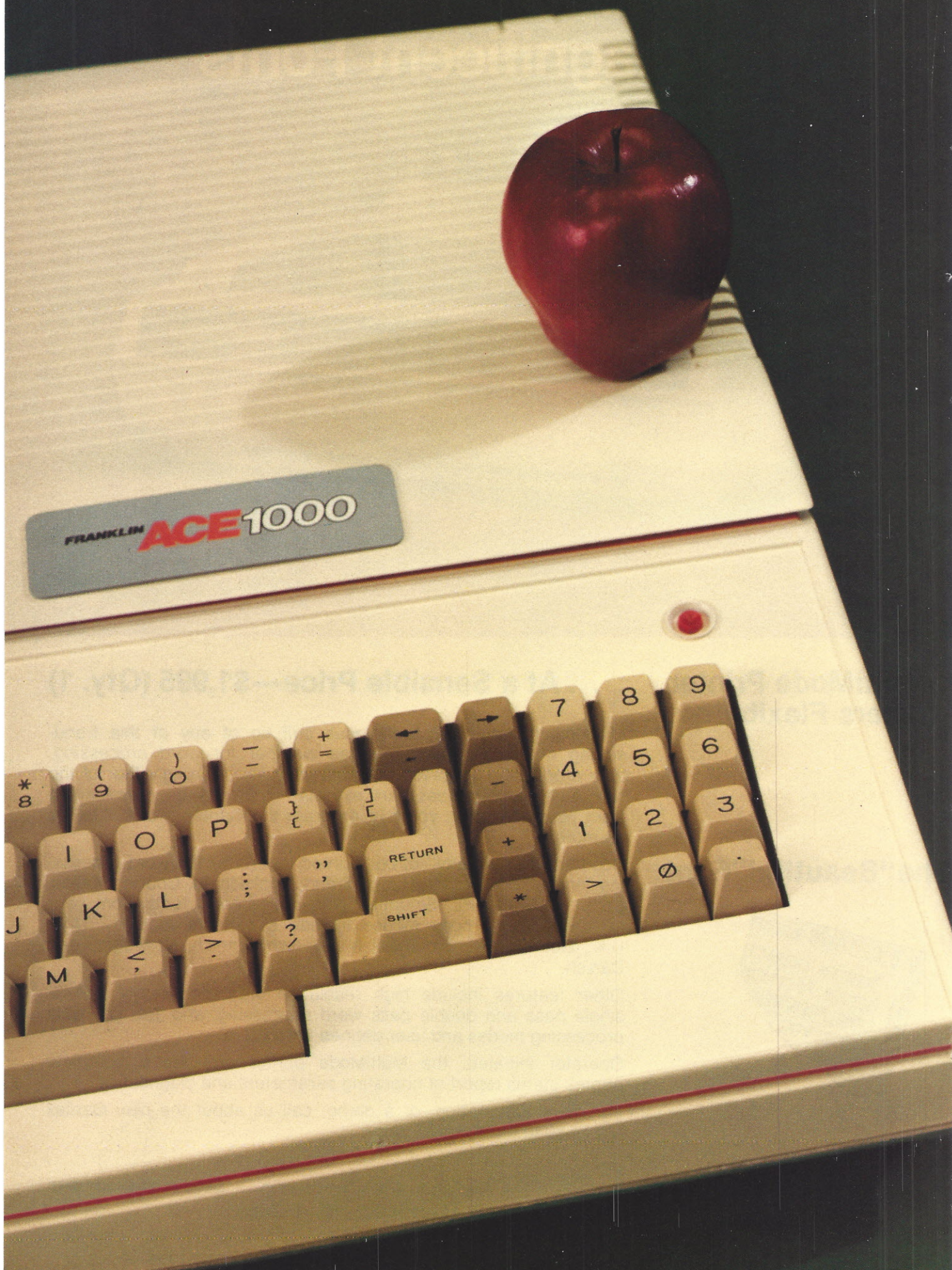
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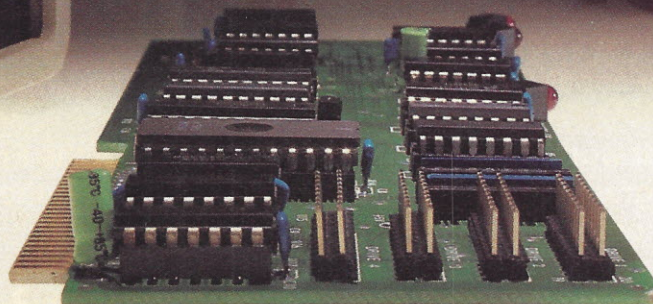
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researchers. Speed is only one consideration in the selection of a business computer—and often is not the most important one. The availability of programs that will enable the computer to perform useful tasks should rightfully be given first priority; other important aspects include expandability of the system, reliability, maintenance service, training and overall dealer support.

Within this larger context, benchmark tests can be used to narrow the field of systems under consideration, and to point out systems with defects in design or programming that render them unacceptably slow.

Our tests of the SD-200 uncovered no significant surprises. The Z80 is probably the most widely-used processor for single-user microcomputers. The SD-200 ran in the middle of the group for most tests and slightly slower than average in the accounts receivable program.

The actual system tested included the desktop processor with keyboard and 12-in. display, and two 8-in. floppy disk drives. The system came with 64,000 characters of memory and a Texas Instruments Model 810 printer. It had one communications channel for use with the printer and one that could be used with a modem for hookup to a remote computer.

Total price as tested, including the operating system and two versions of the Basic language, was \$12,300.

The system can be expanded to yield a total of 256,000 characters of memory. Two extra floppy disk drives can also be added if more filing storage is needed on-line. For users with greater needs, hard disk drives are available with 5, 10, 32, or 96 million characters of storage.

The unit tested included the CP/M operating system, which allows only one terminal but is compatible with a wide range of application programs. The MP/M operating system is available for multi-terminal use, and the more sophisticated Oasis operating system can be purchased for either single or multi-terminal purposes.

The system offers the WordStar package for word processing, but no other business programs. The firm prefers to leave all programming and

sale of packaged programs to the dealers. For users with the Oasis operating system, the firm often recommends accounting programs by Open Systems (Minneapolis, MN).

Service is carried out by the dealer. The system has a 120-day warranty, after which the user may make a separate service agreement with the dealer for additional coverage. The users surveyed for the benchmark

Speed is only one consideration...

report generally noted good hardware reliability and were satisfied with the system. However, a number complained about the accompanying documentation and our benchmark team made similar observations.

SD Systems was contacted for their response to this criticism—the spokespeople admitted there had been a problem with the original documentation. They contended that a new training manual was already in development.

The availability of widely-used operating systems such as CP/M and Oasis leads to a larger selection of software that is either ready-to-run or can be modified with little effort to run on the system.

Still, users should not neglect to evaluate the dealer very carefully, since dealers are given so much responsibility for hardware service and software sales and support. The wise buyer will insist on trying out the programs personally, rather than taking the dealer's word on suitability.

Research Associate: Vic Schoenberg

Hillel Segal is president of the Association of Computer Users, a nonprofit association with members all over the U.S., Canada and several foreign countries. A complete package of information about membership is available from ACU, P.O. Box 9003, Boulder, CO 80301.

Vector Graphic 3005

by Tom Fox



The story of Vector Graphic (Thousand Oaks, CA) is one of steady technical evolution and cleverly-timed marketing moves. One of the pioneers in the microcomputer business, Vector's computers have seldom led the field in technical innovation, but have consistently been carefully-balanced, competently-executed offerings generally well-received within the marketplace.

The System 3005 is representative of this. Except for a Winchester disk drive, the fundamental hardware design is little different from the first Vector Graphic computers sold several years ago—many of which remain steadfast servants to their original buyers. The use of S-100 bus circuit cards; the reliance on the 8-bit Z80 microprocessor; the adherence to a memory-mapped video display screen—are all time-proven design elements. Even aesthetics have remained static. Vector was one of the first companies to perfect the "computer hidden in a terminal" design, a much-copied idea seen in most of today's newest offerings—particularly those originating from Japan.

Software is a somewhat different story. Although retaining the ever-popular CP/M operating system, Vector has made the inevitable transition from a hardware-only supplier to an integrated hardware/software systems manufacturer, doing so with considerably more

grace than most of their competition. This metamorphosis began with a proprietary word processor, which has evolved into the highly-regarded Memorite III product. In fact, a substantial delegation of Vector installations are word processing-only stations; their considerable number-crunching capabilities lying fallow.

Other applications software has been added: the Execuplan II electronic spreadsheet calculator, as well as an integrated set of business applications programs. CP/M bequeaths to all Vector computers the ability to execute a long list of programs from literally hundreds of independent sources.

The Vector software engineers' greatest diligence shows up in their extensive list of systems programs and programmer aids. Whereas many microcomputer manufacturers rely solely on the relatively primitive tools provided with the standard CP/M package, Vector has gone far beyond. To the basic CP/M 2.2 operating system, this manufacturer has added its own editor, assembler and debugging program, among other useful features. The current rendition is called CP/M 2.22J.

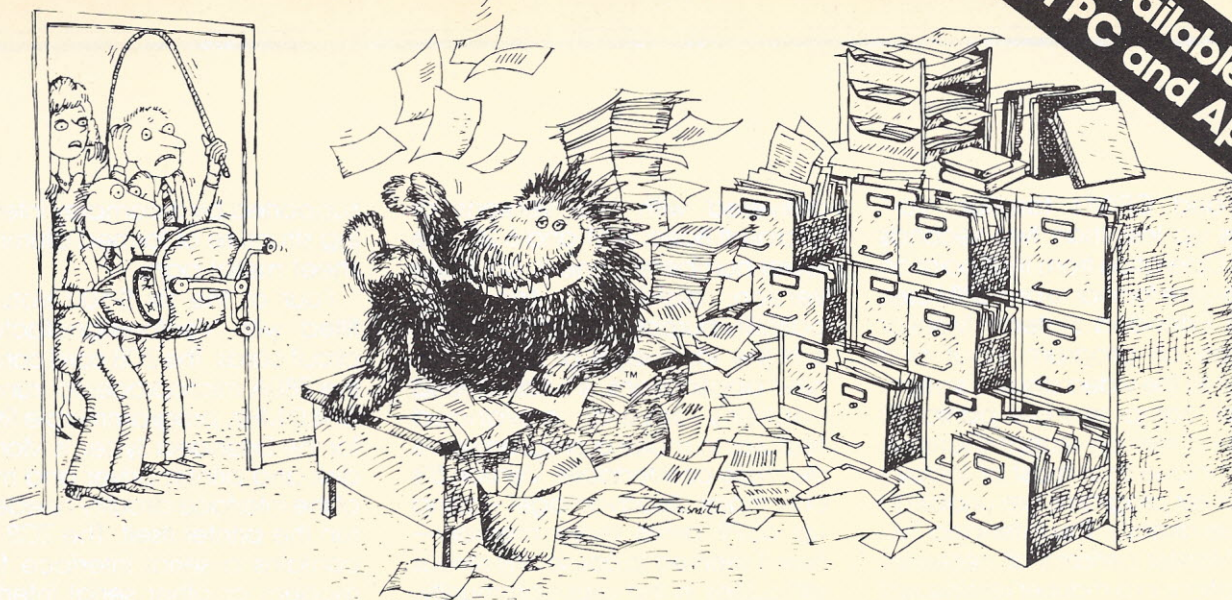
Vector's source program editor is named SCOPE, for Screen Oriented Program Editor. Though perhaps not as friendly as modern office-oriented text editors, SCOPE provides a more powerful and for-

giving tool for program development than CP/M's familiar ED.

Vector's Z80 machine-language assembler is called ZSM. It's an extension of, and replacement for, the standard ASM program from Digital Research. A companion disassembling debugger is appropriately called RAID—Rapid Interactive Debugger. It is utilized for simulating, step-by-step, the operation of an already-assembled Z80 program. During program execution, the active RAID screen displays a plethora of information pertaining to internal computer operation. It's something like watching the electronic readouts of a hospital's Intensive Care Unit, but obviously RAID exposes the vital life signs of a busy silicon chip, not a human life.

In addition to CP/M, the Vector System 3005 includes a second operating system called the Extended Systems Monitor. This is a miniature stand-alone operating system that exists in 2K bytes of program burned into a Read-Only Memory (ROM). When power is applied to the computer, the machine boots up under control of this monitor. Twenty-six single-letter commands may then be entered—many of them of great use to the assembly-language programmer. The most-used command on the System 3005 is "W", which causes the computer to boot up under the CP/M monitor located on the Winchester drive. Push the "W"

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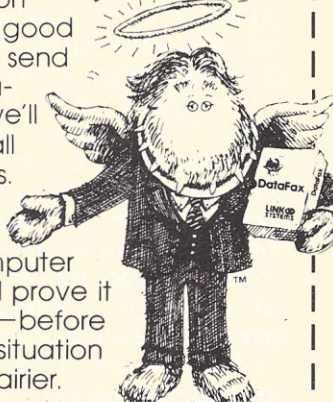
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key, and CP/M's familiar "A>" shows up less than two seconds later. Operation from that point on will be quite familiar to any CP/M user.

The Extended Systems Monitor controls all program input and output to the video display screen. Vector computers are partial to the use of memory-mapped screens, a technique that most of today's computer programs are unable to handle directly. The Extended Systems Monitor performs all necessary translations in a manner reminiscent of device drivers in larger computers,—recently re-introduced on the Apple III.

A memory-mapped screen is one that shares its refresh memory space with that of the main processor. Nearly all video displays need to be refreshed each 1/30th of a second or so, or the image will fade from view. Whereas most terminals contain a dedicated memory for this purpose, memory-mapped displays utilize a portion of the 64K-byte space that is addressable by the main processor. Two important results emerge from this technique: the screen contents can be updated a great deal more quickly than an ordinary display terminal, and the memory space thus used (about 2K bytes) is unavailable for any other purpose.

The System 3005 *appears* to run faster than most other Z80-based microcomputers. The time it takes to update the display screen is often a serious bottleneck in many applications—not so with Vector equipment. Word processing, in particular, benefits substantially from this speedup.

In addition to the 2K bytes of memory lost for video mapping, the System 3005 places several other unmovable programs at the top of the Z80's 64K-byte memory address space. The net result is that only 56K bytes of memory are available for CP/M, user applications programs and program data.

Although nearly any CP/M-compatible Basic will run on the System 3005, the manufacturer has selected Microsoft's offering as standard. Systems are currently

delivered with two versions of Microsoft Basic: 4.51 and 5.20. The lower-numbered one is an older version; distributed for compatibility purposes. MBasic version 5 is the language of choice for new applications. It's faster, and contains several advanced features to make a programmer's life more comfortable. Version 5's only major disadvantage—taking up 6579 bytes more memory—hasn't seemed to cause any serious difficulties in the user community.

Our favorite quick-and-dirty speed test revealed that the System 3005 is about average when compared with most other Z80-based CP/M machines equipped with this language. Our standard benchmark test (JA Aug 81) is a simple Basic program that stumbles through the first 1,000 integers looking for prime numbers in a rather inelegant fashion. The resultant thrashing is usually finished in 10 to 15 minutes and reveals, to a certain extent, how a computer handles simple repetitive calculations in memory. This micro finished the task in 752 seconds for MBasic version 5.20, just 9% quicker than the time turned in by version 4.51. We would expect Vector's line of Z80B-equipped computers (which operate 50% faster at 6.0 MHz) to be correspondingly speedier.

The System 3005 is enclosed within three boxes: a medium-sized terminal, a small disk drive housing and a letter-quality printer. Gazing upon this assemblage, many ask "But where's the computer?" Indeed, the 3005 looks like a collection of orphan peripherals lacking the essential central processor.

Lifting the lid of the "terminal" reveals the secret: most of the computing elements are nestled neatly in and around the essential parts of the video display and keyboard. Vector has managed to fit a full six-slot S-100 card cage inside the terminal housing, along with a generously-proportioned conventional linear power supply. These modules, along with the cathode-ray tube, keyboard and bottom-mounted cooling fan are

supported by a complex interlinking structure of formed aluminum sheet metal parts.

Four of the six S-100 slots are filled with Vector-manufactured circuit cards. The ZCB card contains the Z80A microprocessor running at 4.0 MHz, programmable ROMs for the Extended Systems Monitor, disk and printer driver and much of the interface circuitry needed to run the printer itself. The ZCB also contains a serial interface for a modem or other serial interface device. This circuitry supports data transfer rates from 110 to 9600 baud.

The main memory of the system is contained on a dedicated 64K-byte RAM card. Low-power dynamic RAM chips are utilized on this component. One-eighth of the RAM card, as we've mentioned, lies unused by the System 3005.

Terminal input and output is the function of the Flashwriter II card. This is a rather complex assembly, which performs most of the operations usually found within a stand-alone computer terminal. Circuitry to generate characters and graphics symbols can be found here, as well as the 2K-byte screen refresh memory. Interfacing with the keyboard is also a function of the Flashwriter II card.

The final S-100 board is the FD/HD Controller—the disk controller card. It contains the electronics necessary to interface between central processor and disk drives.

Connection to the disk drive housing and printer is via the moderately awkward means of flat multi-conductor cables. The one to the printer contains 52 conductors, and is no less than 2-1/2-in. wide. The cable connects directly into the innards of the computer and printer; there's no convenient way to unplug it when moving the system from place to place. The cable is a fixed eight feet long, so the printer must always be installed in close proximity to the terminal/processor.

The disk drive cabling is more complex. It's but three feet long, and is actually a neat zipped-up tube containing three separate

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CIRCLE 49 ON INQUIRY CARD

flat cables. Like the printer, the disk housing is connected to the processor in a fixed manner. This device also has another cable, which plugs into the rear of the terminal to draw power for the spinning disks. This inclusion is commendable. Many installations require more A.C. power outlets than are conveniently available near the computer work station.

The nicest parts of the terminal/processor housing are those most directly involved with the human operator. The 12-in. (diagonal measure) screen presents a sharp, unflickering image. It's covered by a fine cloth mesh (acutally a part of the fiberglass cover), which does a fine job of reducing screen glare from overhead lights or open windows.

Vector engineers have paid considerable attention to the keyboard design. The shape and key layout mimics that of the ubiquitous IBM Selectric typewriter. The keys themselves offer good audible and tactile feedback.

The separate mass storage housing contains two 5-1/4-in. disk drives of widely differing designs. The System 3005's main storage is contained in one of them: a Winchester-technology device containing two hard disks with a total of 5M bytes of storage capacity. Average access time is 170 mS—somewhat slower than the sub-100 mS time to be found in many of today's similar drives. However, this speed is not as critical in single-user systems such as the 3005 as it is in multi-user installations.

The second disk drive will accept a hard-sectored minifloppy diskette. It is used to transport programs and data between the 3005 and other computers. The floppy is also the means by which the user performs the essential duty of backing up programs and data. A single diskette will hold 630K bytes; both sides are used. It takes eight diskettes to completely back up the hard disk when it's filled to capacity.

The printer usually provided with the System 3005 is a private-

labeled version of Nippon Electric Company's model 7700Q. This is one of the most highly-regarded word processing printers in the industry. Characters are formed via an interchangeable spinning thimble, and it operates at an average of 55 characters per second. There are no quicker letter-quality impact printers that we know of; it's apparent that Vector made few compromises in printers selection. Even the extra-cost vertical tractor feed is included as standard.

User documentation provided with the System 3005 is very good. The manuals are clearly written, complete and helpful to both the end user and dealer-level technician and programmer. The Mem- orite III documents, in particular, might serve as examples for others to follow.

The System 3005 package retails at \$7,950, and the NEC printer will cost \$3,450 more. Lower-cost printers are available if you don't need letter-quality output. The basic system includes the CP/M operating system, Microsoft Basic and the special systems software contributed by the Vector programmers. Our laboratory test model also included a clutch of undocumented but well-executed action games to help first-time users limber up with their new purchase. The Execuplan II spreadsheet calculator lists for \$200. At \$450, the Memorite III word processor is a bargain. It includes a spelling dictionary and mailing list merge program. □

Technical Editor Tom Fox has authored over 50 articles and editorials for IA since May, 1979. He has spent his entire 21-year career in the field of electronics; with the last 14 years devoted to computer systems and their application to business and industry. He is President of FoxWare Systems Corp. (Irvine, CA), a firm specializing in the integration of microcomputers and applications software for small business users.

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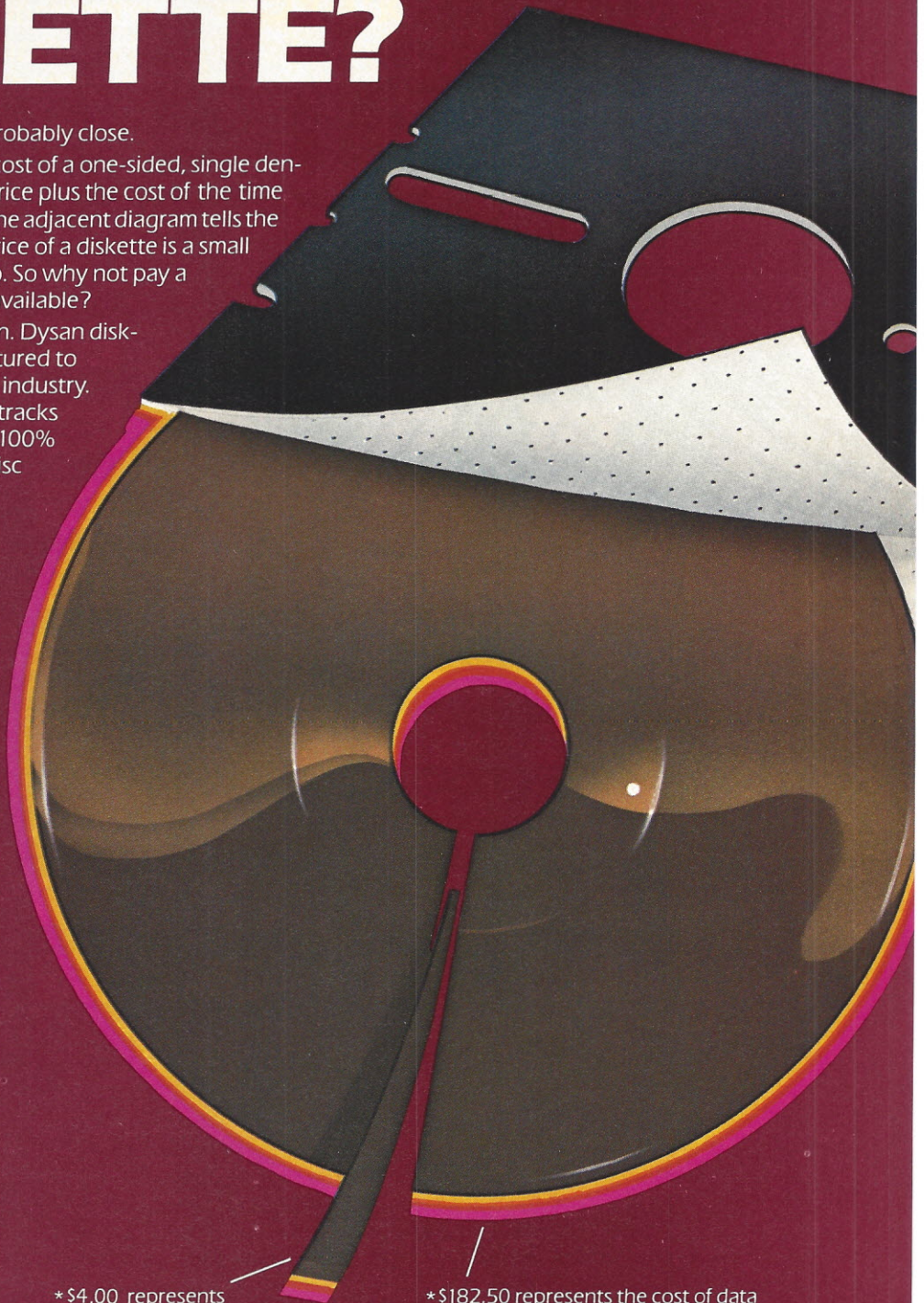
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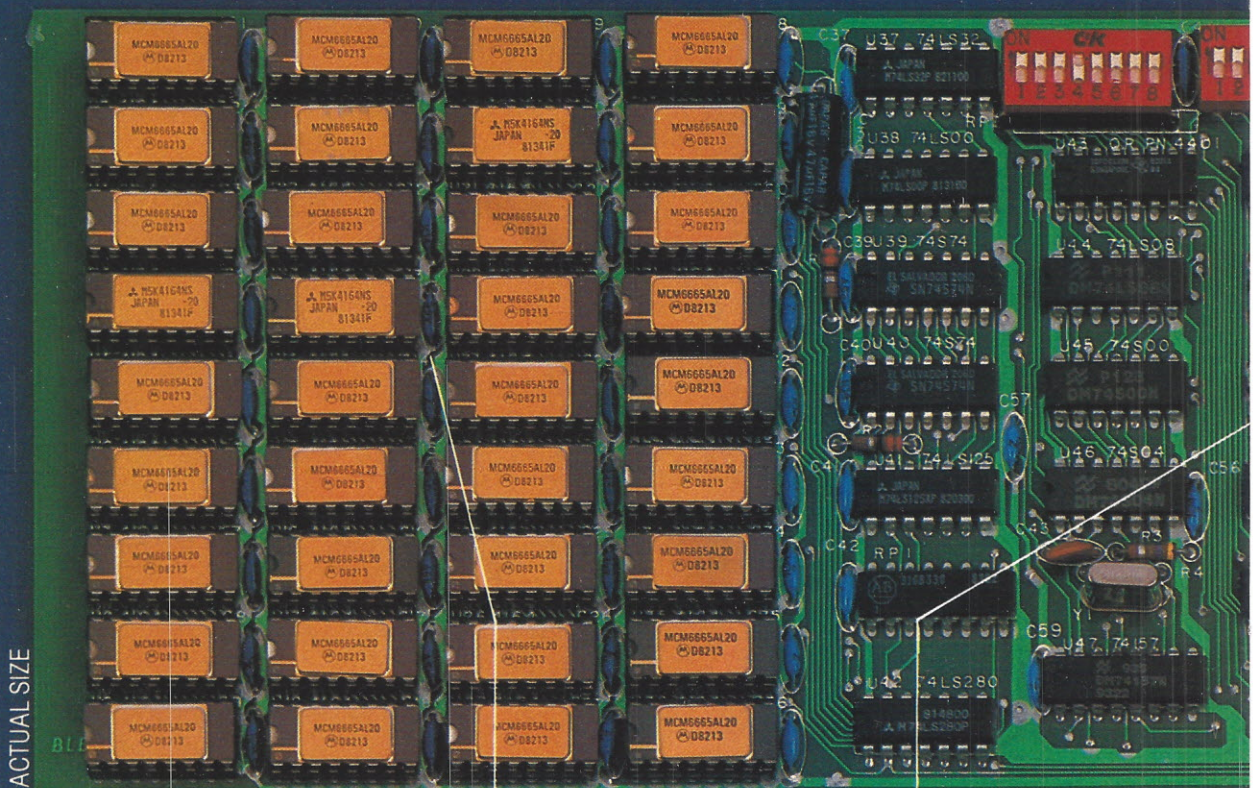


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ASYNCHRONOUS (RS232) COMMUNICATION ADAPTER.

Using the same chip as that on the IBM ASYNC board, the device is software programmable for baud rate, character, stop, and parity bits. A male DB25 connector located on the back connector is identical to that on the IBM Async Adapter. The adapter is used for connecting modems, printers (many letter quality printers require RS232), and other serial devices. Switches allow the port to be configured as COM1 or COM2 and the board fully supports IBM Communications Software.

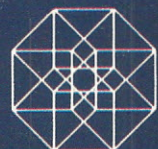
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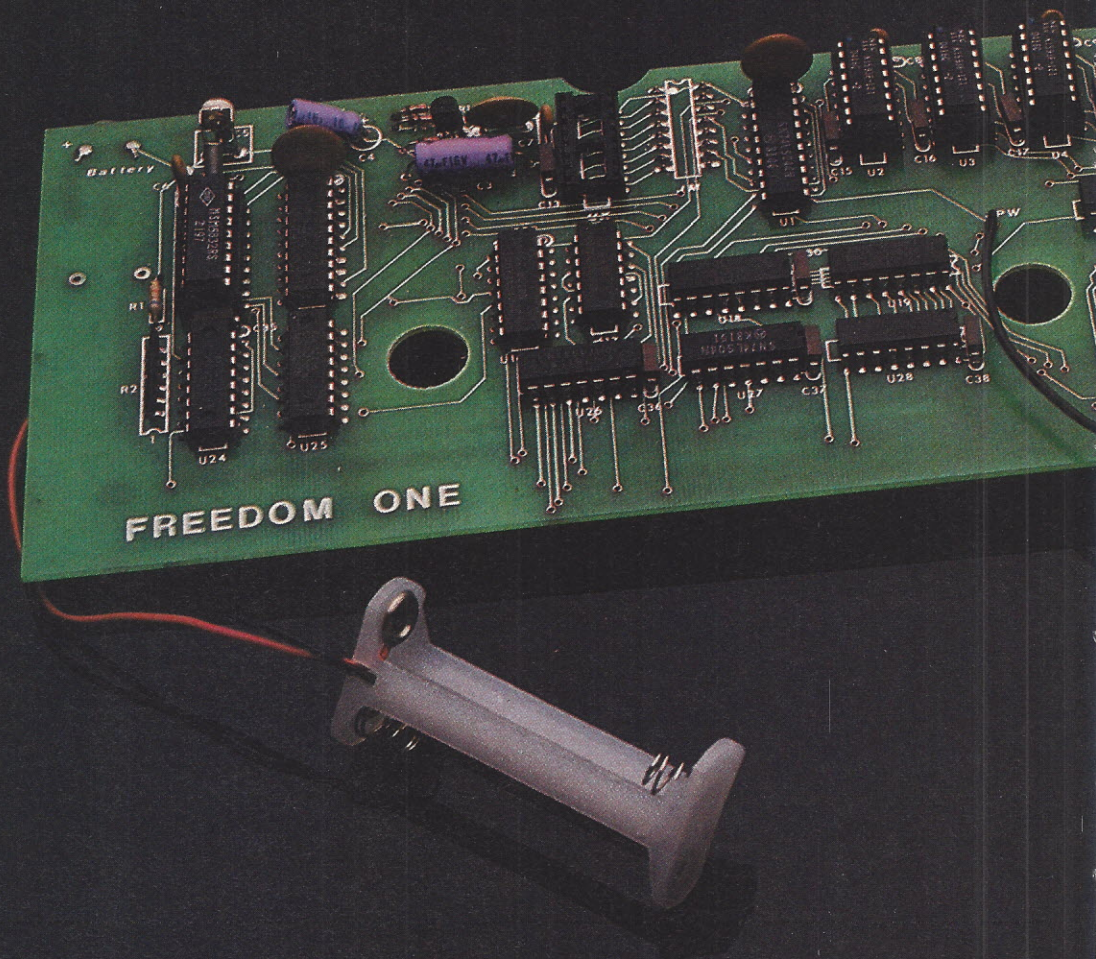
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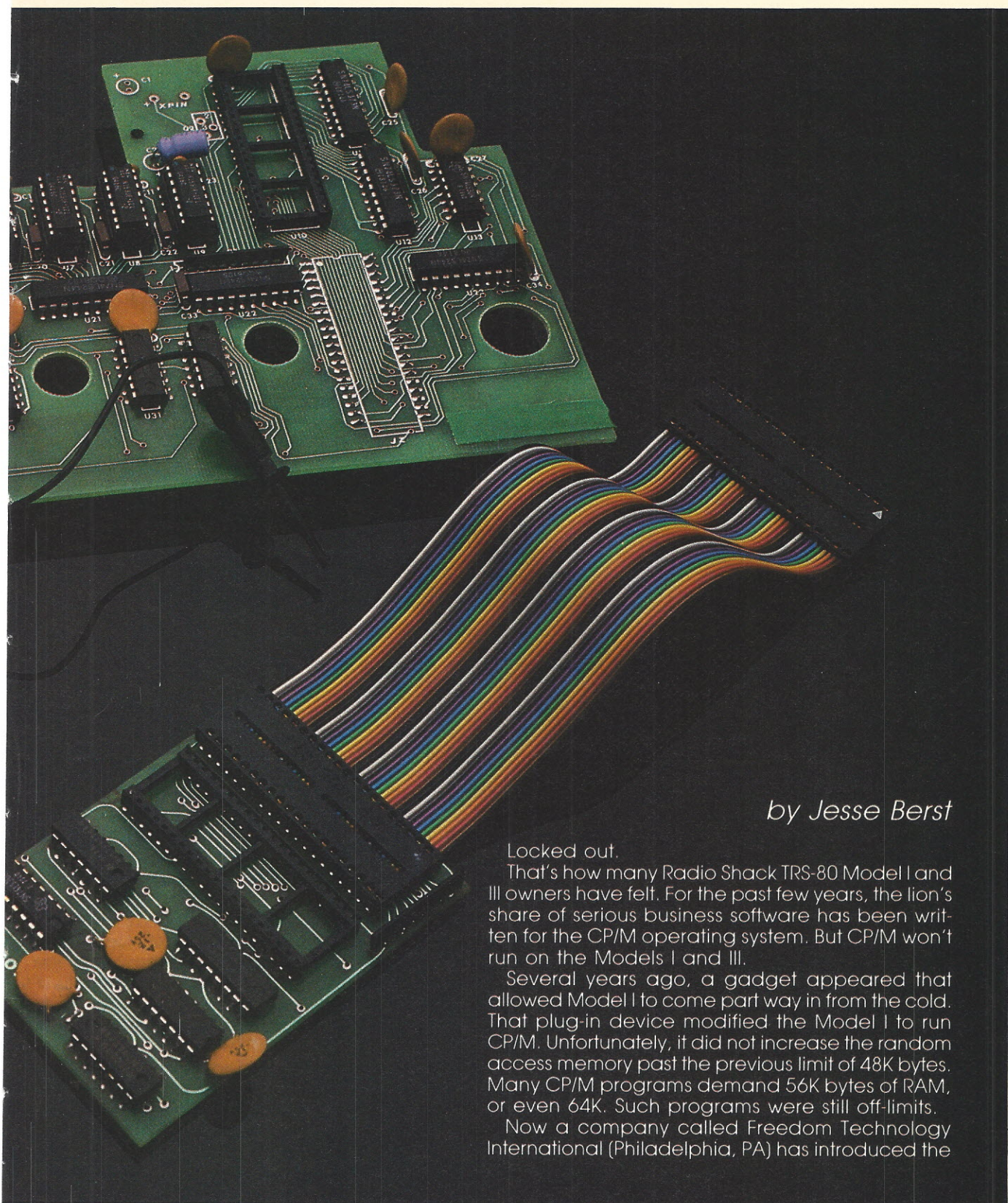
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CIRCLE 73 ON INQUIRY CARD



Setting the TRS-80 Free

CP/M Option for TRS-80 I and III



by Jesse Berst

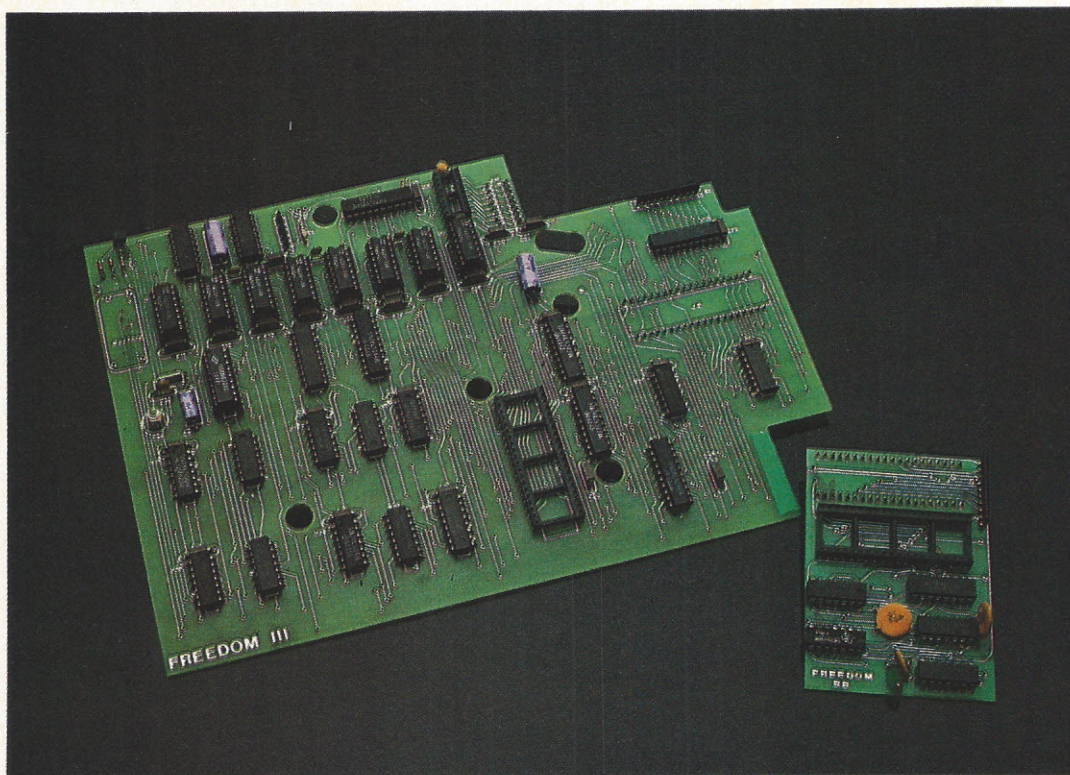
Locked out.

That's how many Radio Shack TRS-80 Model I and III owners have felt. For the past few years, the lion's share of serious business software has been written for the CP/M operating system. But CP/M won't run on the Models I and III.

Several years ago, a gadget appeared that allowed Model I to come part way in from the cold. That plug-in device modified the Model I to run CP/M. Unfortunately, it did not increase the random access memory past the previous limit of 48K bytes. Many CP/M programs demand 56K bytes of RAM, or even 64K. Such programs were still off-limits.

Now a company called Freedom Technology International (Philadelphia, PA) has introduced the

Freedom Plus (large board) Freedom Option (small board) for TRS-80 Model III and LNW-80



Freedom Plus (large board) and Freedom Option (small board) for TRS-80 Model I

Freedom Plus. According to the advertising claims, this board plugs into the Model I or III, delivering 64K bytes of RAM plus CP/M compatibility (the same firm sells 48K versions under the name Freedom Option). These products come with a choice of CP/M 2.2 or a CP/M-compatible operating system called T8-OS.

Is the Freedom Plus for real? Is it the key that will give the Models I and III entry to the CP/M arena? While the hardware and software do exactly what the ads claim, the instruction manual is unclear; non-technical users will have difficulty making these products perform. Although the company has new documentation in the works, the current manual simply does not make the grade.

The Freedom Plus also comes in versions for TRS-80 workalike computers made by LNW (Tustin, CA) and Personal Micro Computers (Mountain View, CA). We tested the versions for the Radio Shack Models I and III.

The Freedom Plus module is installed by plugging it directly into the CPU circuit board (see photos). Unlike computers such as the Apple II and the IBM PC, the TRS-80 has no built-in expansion slots. Adding another board takes some time and trouble—about 30 to 60 minutes if you don't run into problems.

To put the board in, the computer case must be opened, but there's no need to solder or cut wires. Experienced hobbyists and kit builders will find

installation a snap. Those without much technical expertise may encounter a few minor roadblocks.

The Freedom Plus installs in the keyboard of the Model I. After opening the case, you unscrew the circuit board and flip it over to reveal the components. You unplug two chips from the TRS-80's board and plug them into empty sockets on the Freedom Plus.

Now comes the first real hurdle. Pins projecting from the bottom of the Freedom board correspond to the sockets of the chips you just removed. The board must be plugged into those vacant sockets. The pins are fragile and barely long enough to reach—you will need to take extra time and caution at this stage.

Once the device is plugged in, you attach a small clip to the TRS-80 board. Now the second hurdle: getting everything back into the case. You'll wish you had three hands at this point, so it may not be a bad idea to have a friend standing by. You must hold the two circuit boards together, then flip the entire assembly over to replace it in the keyboard case. If the boards separate, you must turn everything over, re-attach the Freedom Plus board and try again.

With the combined assembly back in the case, you come to the final roadblock: putting the cover

Continued on page 138

Freedom Technology International

ANNOUNCES

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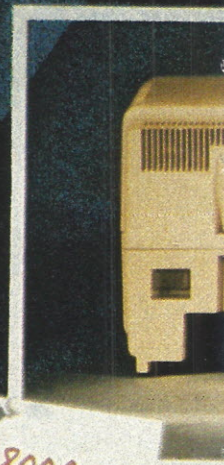
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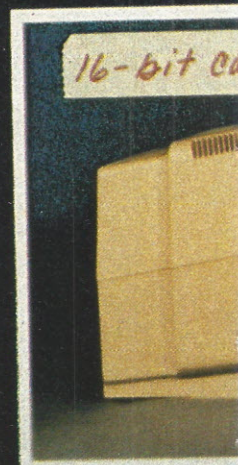
Existing Model II software is compatible



Hard disk storage of 8.4 M-bytes can be added



MC 68000



Pr

Introducing the TRS-80 Model 16

by Terry Benson

Tandy/Radio Shack (Forth Worth, TX) has just reinforced its position in the small business marketplace by adding 16-bit capability to an already popular system. The TRS-80 Model 16 incorporates the very powerful MC68000 in addition to all of the features available in the Model II. For an additional \$1,150, the Model 16 offers a substantial increase in performance, plus enhancements to the existing Model II functions that alone may be worth the extra cost.

Since all features of the three-year old model II are included in the newer system, we'll begin by highlighting some of its specifications. It is based on a 4-MHz version of the Z80A with 64K bytes of RAM. An integrated 12-in. CRT displays 24 lines of 80 (or 40) characters. A single 8-in. single-sided drive is built into the desktop unit providing a capacity of about 400K bytes. A detachable keyboard offers 76 keys, which include a numeric keypad and two programmable special function keys.

External floppy disk drives can be added with an expansion unit supporting up to three additional drives. Hard disk storage of 8.4M bytes can be added to the system to increase throughput. Other peripherals can be attached to the two built-in RS-232 ports or the parallel port (usually reserved for a printer).

The TRSDOS operating system orchestrates all of the system interactions. This easy-to-learn operating system provides a useful set of commands and utilities to assist the programmer or the casual user. A comprehensive Basic is included with the operating system. Other programming languages, notably Cobol, and a legion of application programs are also available.

What about the improved functions? The first improvement is increased floppy disk capacity. TRSDOS has been modified to operate with 32—rather than 26—sectors per track and, with the new thinline drives from Tandon, uses either single or double-sided diskettes. The new format more than



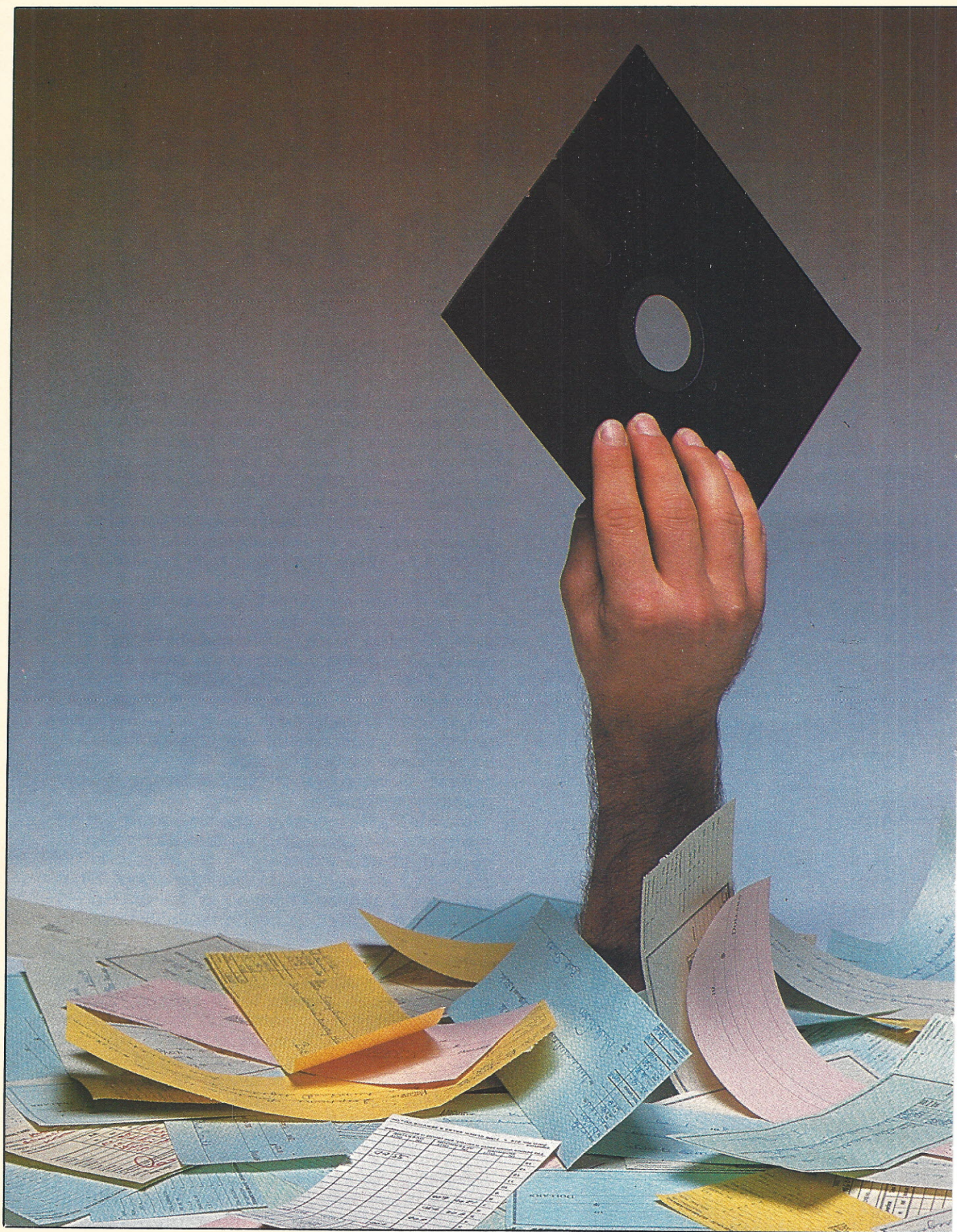
bytes of RAM



999. —

Continued on page 142

SPECIAL REPORT



Buyer's Guide to Payroll Packages

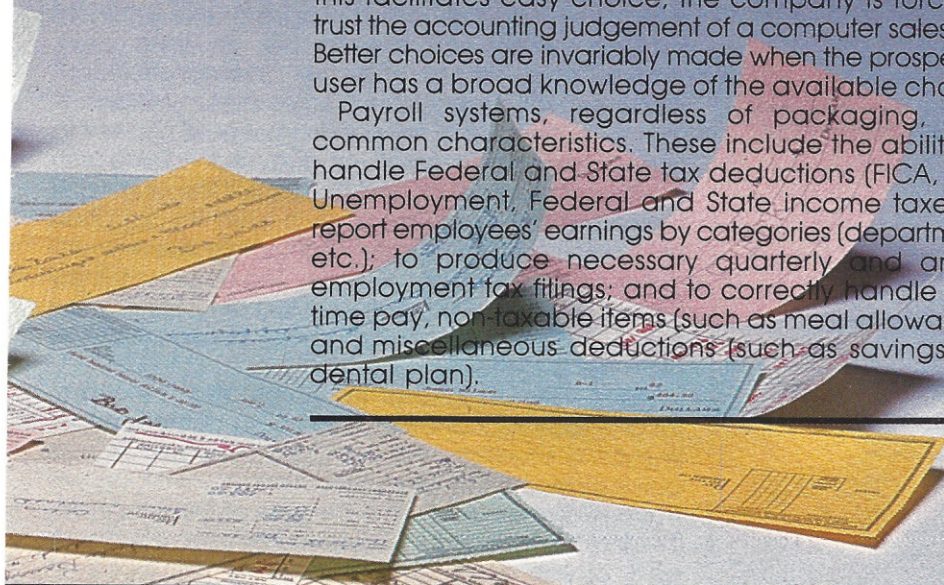
by Carl Heintz, C.P.A.

Payroll preparation is one of the applications best suited for a computer—it's no wonder that in almost every firm of any size, a computerized system is used to perform repetitive calculations, detail tracking and report preparation.

Selecting a good payroll program is a delicate process. Without exception, this is one of the most sensitive areas in any company's record-keeping. The need for confidentiality, reliability, accuracy and accountability are imperative. Selection should be a decision based on a collaborative venture between accountants and general management.

Too many users select software based upon a particular hardware vendor's recommendations. While this facilitates easy choice, the company is forced to trust the accounting judgement of a computer salesman. Better choices are invariably made when the prospective user has a broad knowledge of the available choices.

Payroll systems, regardless of packaging, have common characteristics. These include the abilities to handle Federal and State tax deductions (FICA, State Unemployment, Federal and State income taxes); to report employees' earnings by categories (departments, etc.); to produce necessary quarterly and annual employment tax filings; and to correctly handle overtime pay, non-taxable items (such as meal allowances) and miscellaneous deductions (such as savings and dental plan).



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Actually, this list is only a selective highlight of the many features a good payroll system should have. The accompanying chart lists over 35 categories.

A note of caution: this survey is just that—only a *survey* of what is available. To reach a legitimate conclusion on a software product, three steps are necessary:

- 1) Review the input sequences (i.e., the screens, edits and prompts)
- 2) Review the output (reports, etc.)
- 3) Ascertain whether or not the program is written with integrity. (Does it run like it should run?)

There is only one good way to determine software effectiveness—use it. Playing with a program for a few hours is the best way to tell if it is well-designed and executed. The salesman may be helpful in

*If the user can't
figure out the program
after a brief introduction,
either the manual or
program is poorly written*

getting you started with a program, but within 15 minutes or so you should be on your own. Unfortunately, many software "demonstrations" become well-orchestrated sales presentations. A user selecting a payroll program would do well to spend some time—totally undirected—alone with the program, manual and terminal. If the user can't figure out the program after a brief introduction and training from the salesman, either the manual or the program is poorly-written. The other possibility is that the user isn't oriented to learning how to use the system. In such instances, a service bureau may be a better choice.

There are situations in which the program, for one reason or another, cannot be demonstrated. In such a situation, the prospective buyer should always review the manual carefully—it alone will have to demonstrate the integrity of the program. It's also a good idea to ask for a few user references and check them out. Talking to someone in a similar-sized business who has purchased the

SEPTEMBER 1982

program and implemented it will give a respectable indication of the true worth of the program.

Reviewing report generation is a critical step. In such a subjective area, each user must establish his own conclusions. Some basic criteria for judgement, however, might include the following: Be sure that you understand every figure shown on each report and that you can read the report quickly, without having to search for figures. Ask yourself whether the report leads you from one item to another logically. Also, permit your bookkeeper, assistant or accounting clerk to look at the reports and critique them.

One of the most important resources available to the businessman in the choice of a payroll system is the company CPA. The expertise and objectivity brought to the decision process can be a valuable input. Your CPA should have had specific training and orientation to microcomputers: if not, we recommend finding one who does.

A good payroll program must be somewhat flexible. Odds are that the program will be soon outdated, and the investment of the user lost forever if the program doesn't permit adaptation.

Some programs provide the user with source code—allowing changes to be made directly to the program. That's a good feature if the user is computer-oriented and has the ability or the access to a good programmer. If that is the only mode for altering the program, the user may be in serious trouble. Many companies provide yearly updates for a small fee. The user should ascertain in advance—in writing—that the company will support the software for a certain period of years at a set cost. Don't depend on company longevity. Request the source code if available.

One of the biggest problems with payroll programs, in general, is the manner in which they handle the unique occurrences of daily life. There are many of these "one-shots" that can decimate an otherwise orderly payroll system. For example, consider: errors in employees' checks; hand-written checks; changes in withholding exemptions—retroactively applied; termination pay (will the program deduct at a larger bracket because the lump sum gross is bigger?), and undisbursed income (such as stock bonus or payment in kind—inventory, excess group life insurance, etc.).

Continued on page 144

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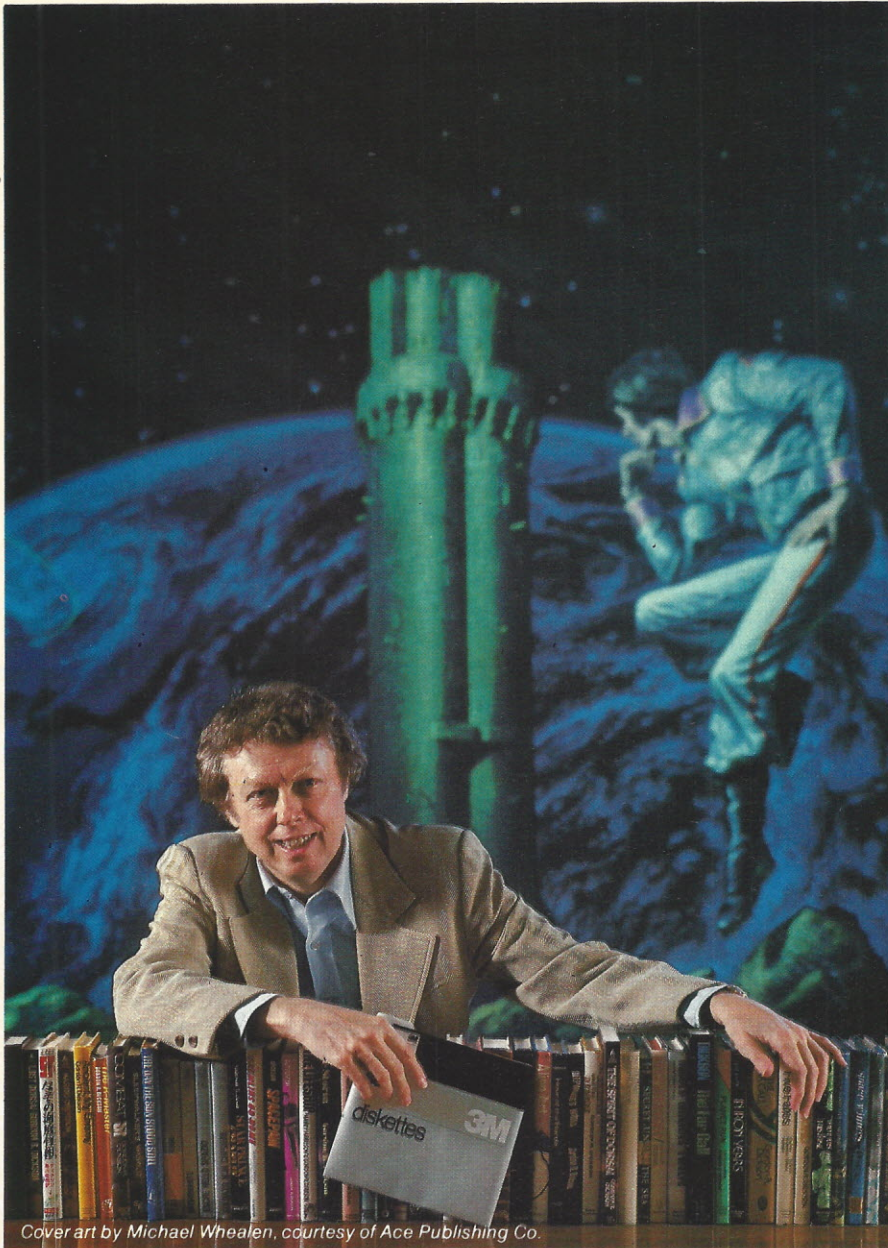
**Gordon R. Dickson,
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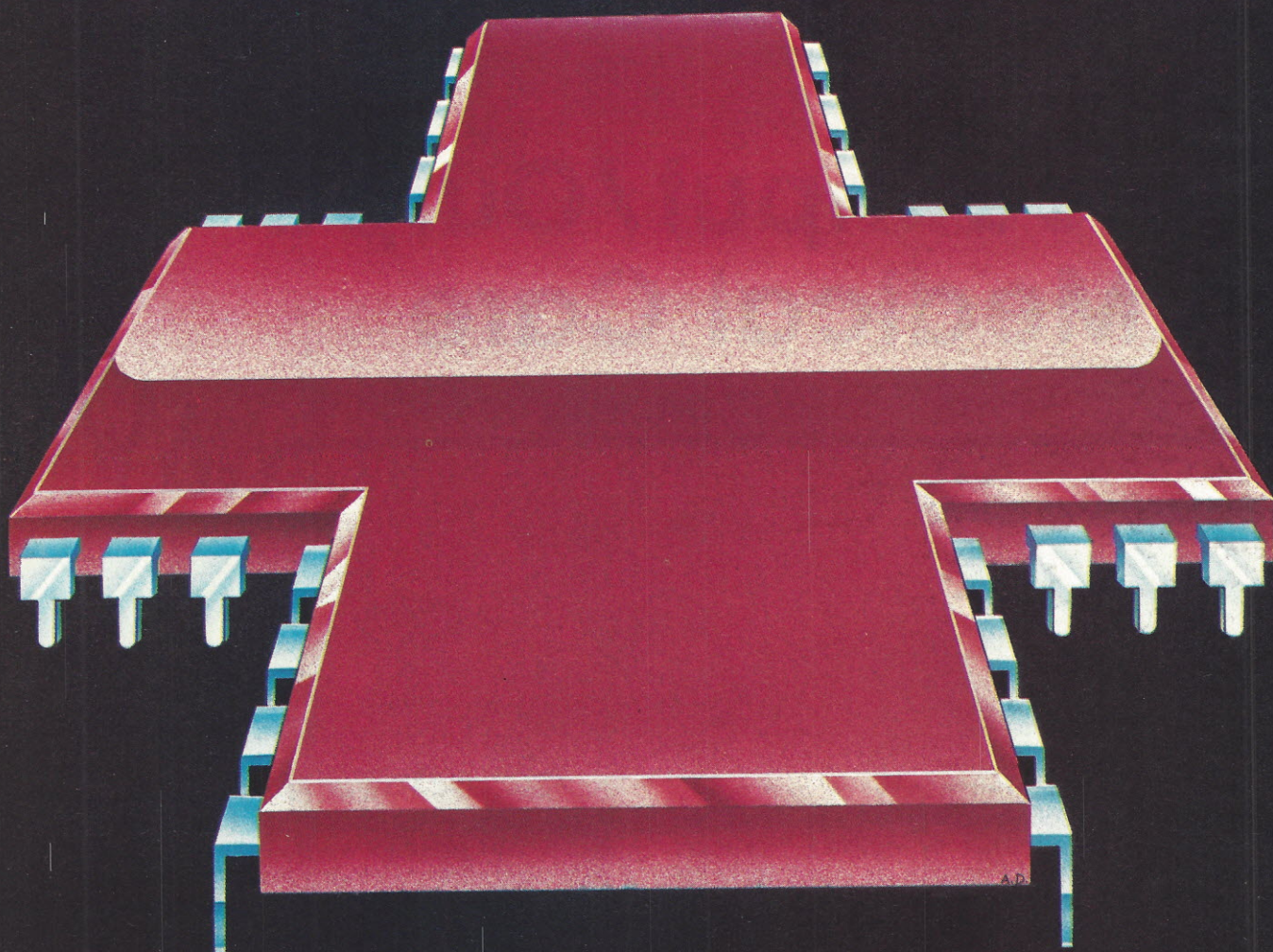


Cover art by Michael Whealen, courtesy of Ace Publishing Co.



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MEDICAL APPLICATIONS

Voice Input/Output in Medical Care
Micros in the Physician's Office Lab
Micros in the Emergency Department

Voice Input/Output in Medical Care

by William W. Creitz



Throughout the brief history of computers, designers have sought to make these machines increasingly human-like. By making the man-machine interface as natural as possible, automated devices may be used by a broader range of people—with less attention to the mechanics of the interchange.

Voice is the most natural way for humans to communicate in real time. Computer interfaces that produce and recognize human speech open up an important and versatile communication channel between humans and machines—and in some cases, between humans and humans. Voice output is the production of human-like speech by synthetic, electronic methods.

Speech synthesis provides a way for machines—or people who control machines—to communicate with people. Speech recognition by electronic means is a way for humans to verbally input information or commands into computers. This technology is not being ignored by the medical field; many practical applications have been developed to benefit both patients and doctors. Let's consider several examples.

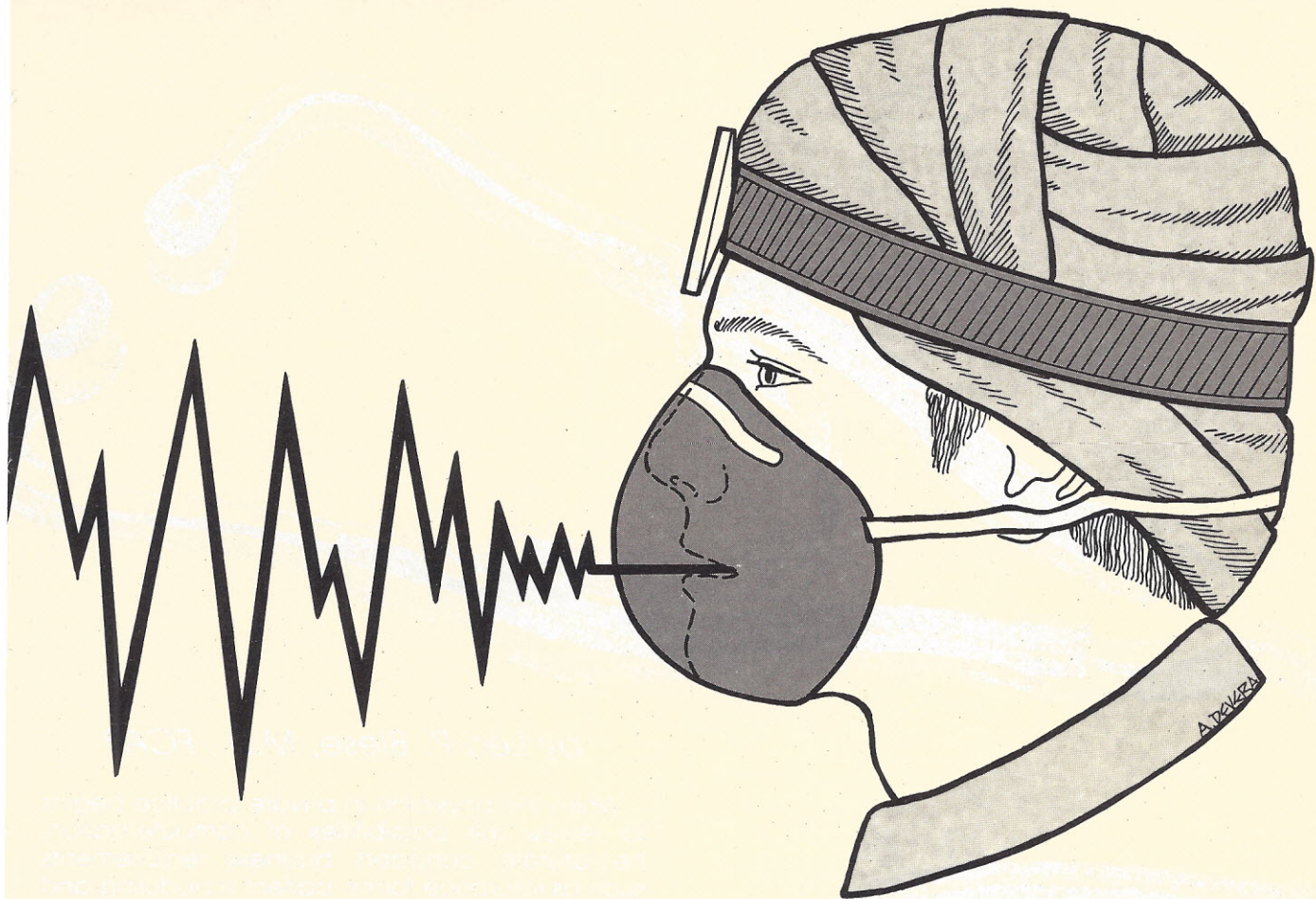
Aids for the visually and vocally impaired

The unlimited vocabulary facilitated by formant synthesis has immense utility for the blind. By giving the power of speech to a computer or terminal, many opportunities for unsighted individuals

become evident. Jobs such as computer programming, data entry, order and claims processing, reservation services, word processing, information management and legal research can be easily handled by the blind if computer speech output is available.

The Type-'N-Talk speech peripheral manufactured by Votrax (Troy, MI; see *IA* Aug 82) or the Echo series made by Street Electronics (Anaheim, CA) can add unlimited vocabulary speech to a computer inexpensively. Triformation Systems (Stuart, FL) and Maryland Computer Services (Forest Hill, MD) have packaged unlimited vocabulary components into conventional terminals to provide full CRT and keyboard capabilities along with speech output. Maryland's product line includes a talking computer system based on the HP-125 desktop computer by Hewlett-Packard (Corvallis, OR). Equipped with CP/M, the system hosts a wide variety of personal and business software.

Talking terminals provide control over speech rate (from 50 to 700 words per minute), tone, pitch and volume, and have a headphone jack so that listening may be done privately or effectively under noisy conditions. Information can be spoken as it is sent to or received from a computer and an operator may listen to a page, line or single word at a time. To verify spelling or words that are not pronounced well, single characters may be spoken. The user may extend vocabulary to



correctly pronounce mnemonics, abbreviations, symbols and so forth. Keyboard input may be verified by having the terminal speak each key as it is depressed.

Printed materials present an information barrier to the visually impaired. Information in Braille, large type or audio tape form is equal to only a small

Optical character recognition coupled with speech synthesis enables the machine to read text and convert it to speech

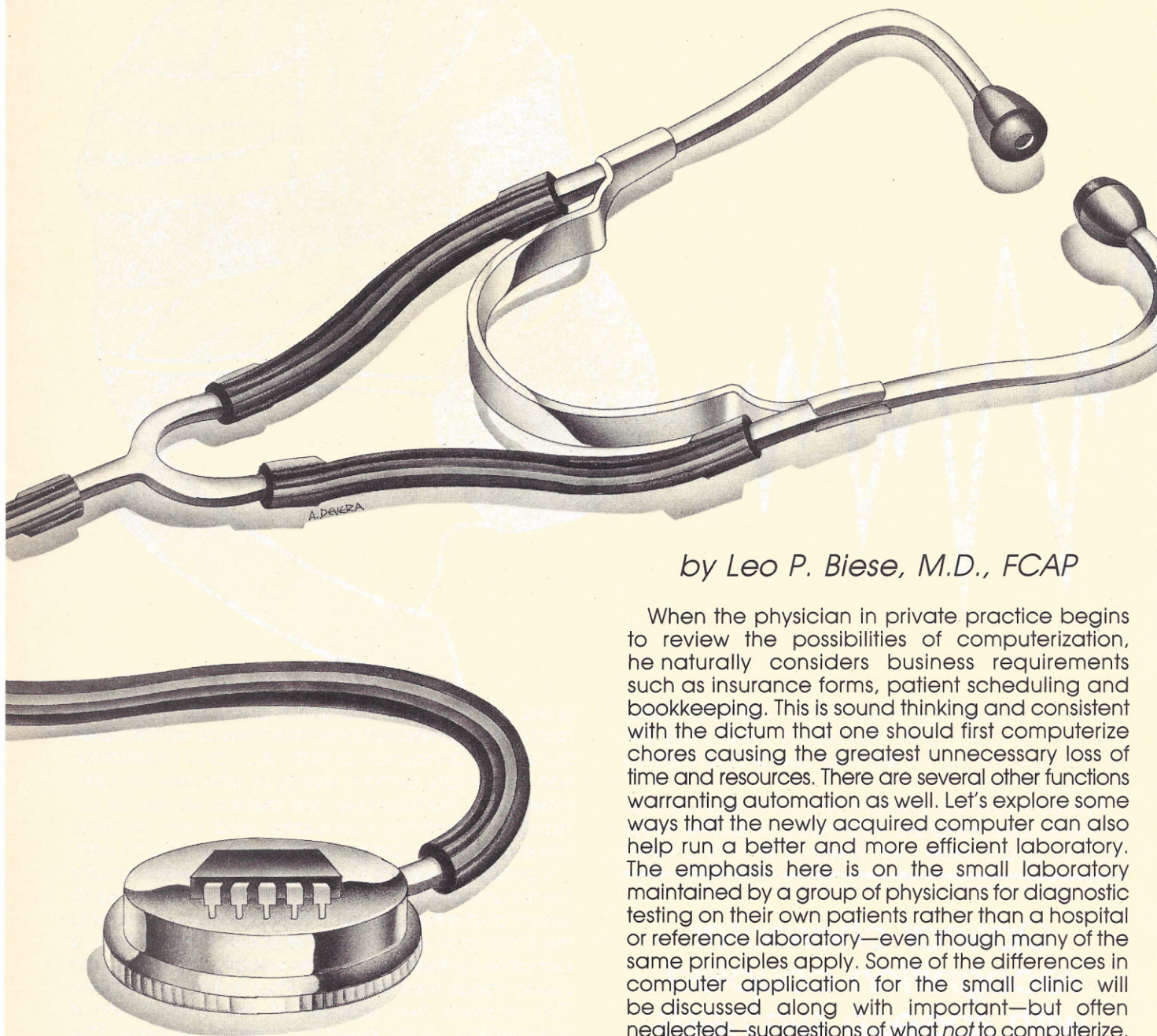
fraction of the total amount of printed material available. Kurzweil Computer Products (Cambridge, MA) has married optical character recognition with speech synthesis to create a machine that reads books, magazines and typewritten text, and converts them to English speech. The device can recognize over two hundred styles of print. Like talking terminals, the Kurzweil Reading Machine

gives users control over pitch and rate of speech and can also repeat previous lines or words, spell out words, announce punctuation and capitalization and mark certain words or phrases for later reference. Additionally, the device serves as an advanced talking calculator and can provide voice output for computers through an RS-232 port.

Vocally impaired individuals have traditionally communicated by signing, writing or pointing to words and letters. Speech technology is improving this limiting situation with the speech prosthesis, a portable synthesizer that the vocally impaired can use to speak their thoughts. Phonic Ear (Mill Valley, CA) markets two models of the Phonic Mirror Handivoice, both based on formant synthesis. The models differ primarily in input method: one utilizes a 128 position touch sensitive menu; the other is controlled by a 16-button keypad.

The units are preprogrammed to produce several hundred words, as well as the 26 letters of the alphabet and common phrases such as "My name is..." Additionally, common prefixes and suffixes and 45 phonemes are available for creating words not in the vocabulary. Memories allow users to string together phonemes to make words, and string words and pauses to make sentences, then speak the sentences on command. Both units are battery powered and weigh only about six pounds.

Continued on page 154



by Leo P. Biese, M.D., FCAP

When the physician in private practice begins to review the possibilities of computerization, he naturally considers business requirements such as insurance forms, patient scheduling and bookkeeping. This is sound thinking and consistent with the dictum that one should first computerize chores causing the greatest unnecessary loss of time and resources. There are several other functions warranting automation as well. Let's explore some ways that the newly acquired computer can also help run a better and more efficient laboratory. The emphasis here is on the small laboratory maintained by a group of physicians for diagnostic testing on their own patients rather than a hospital or reference laboratory—even though many of the same principles apply. Some of the differences in computer application for the small clinic will be discussed along with important—but often neglected—suggestions of what *not* to computerize.

For purposes of discussion, we can consider laboratory computer utilization under the following six categories: 1) statistical and general mathematical functions; 2) housekeeping (the computer as list keeper); 3) management (keeping the lab solvent); 4) interpretive reporting; 5) computer-aided instruction (CAI); 6) communications; lab results on time.

Naturally, overlap occurs between these arbitrary divisions. We will not consider the important area of direct interfacing with the various automated laboratory devices common only to the larger laboratory. A discussion of word-processing-related functions crucial to the small medical clinic—but not directly related to the laboratory—will also be avoided.

Micros in the Physician's Office Lab

Statistics and mathematics

These functions are a natural outgrowth of the extensive use of calculators. Many useful derived indices have been developed over the years by manipulating the results of one or more combinations of laboratory values; Blood urea nitrogen and creatinine ratio, creatinine clearance, amylase clearance and the amylase/creatinine ratio all provide useful information. Some other readily-calculated values are the ionized calcium, anion gap, base excess and others dealing with acid/base balance, the many respiratory function indices and estimated thyroid binding globulin. Much of the time, potentially useful information is lost because there is not enough time to perform intricate mathematics for every test. Remembering the correct formula is also difficult at times. With very little programming effort, these derived values can simply be strung together in one menu-driven program. Better yet, they can be automatically incorporated into the reporting process.

It is widely recognized that each laboratory should fine-tune its normal value ranges. The normal values for a practice having a patient distribution consisting primarily of the elderly will obviously not be the same as that for a population of young college students or that of a practice heavily weighted to preventive medicine executive physicals. Similarly, there is a considerable difference not only between age and sex, but between the ambulatory and the bedridden patient and joggers, who have significantly higher normal values for some chemistries. In the past, it was simply too time-consuming to calculate these values. The normal ranges printed in articles, standard textbooks or those provided by a reference laboratory were accepted. The result has often been a large gray area in which the normal has not been clearly contrasted with the abnormal.

Recent research shows that the application of discriminate analysis can markedly reduce this area of uncertainty. The definition of specific population normals with a program such as NORMVAL is reduced to simply entering the numbers; both the statistical values and a histogram of the population are printed out in minutes for a task that would ordinarily take days and, therefore, probably not be done at all.

Programs to perform the actual analysis are widely available on larger university systems, but we are not aware of successful micro implementations. Most of these either require more than 64K bytes of memory or are highly specific to an individual problem.

Another program, LABQC, calculates quality control statistics, prints the charts and offers cumulative review of the data and even compares precision with that obtained from the CAP Survey.

Quality Control is one of the most frequently-neglected areas in the small clinic laboratory. State and federal regulations require that larger laboratories run both normal and abnormal controls with each series of analyses for every test the laboratory performs in addition to periodic analysis of unknowns (quality assurance) for comparison with a peer group. This does not apply to the individual or small clinic laboratory serving only its own patients.

Parallel testing is very expensive and typically represents 10-15% of all testing done by the laboratory. As such, it is often viewed as non-productive for the small clinic. The microcomputer

It is difficult for the small lab to evaluate new methodologies based on some rational criterion other than the latest advertising hype...

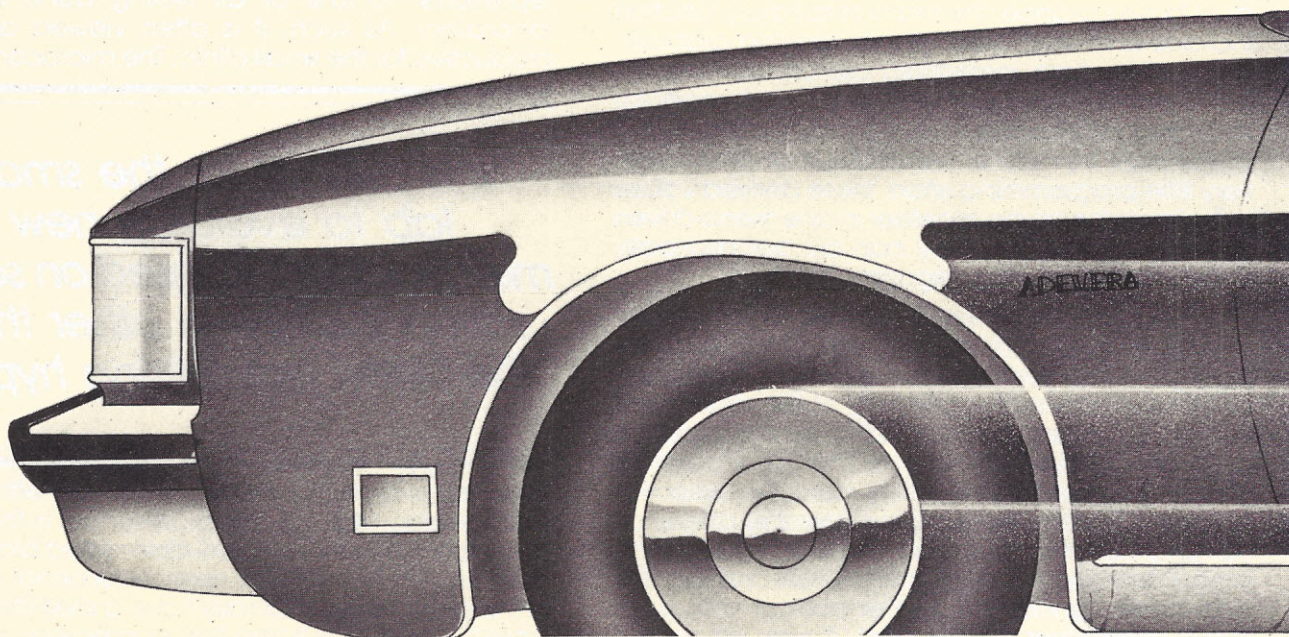
can, however, bring many of these benefits to the smaller laboratory. A typical example is the daily precision verification of semi-automated blood cell counters. The commercial normal/abnormal controls are expensive and typically have a shelf-life of four weeks or less. The same test of precision can be adequately performed by simply re-testing two arbitrary specimens held over from the previous day and comparing the results with a statistical program such as PRECISE, which will also print a monthly summary and a wall chart of daily testing status (Levi-Jennings Chart). Similar tests of precision (calibration) of analytical equipment can be performed by other statistical tests such as the walking-mean of relatively constant values such as the Mean Corpuscular Volume.

When commercial quality control standards are purchased for other sections of the lab, such as the more common chemistries, or home-made known standards are employed, a variety of QC programs are available to evaluate the results on a daily basis and produce the appropriate graphs and archival records so that you actually *know* laboratory values are correct.

It is difficult for the small laboratory to evaluate and select new methodologies based on some rational criterion other than the latest advertising hype or the entreaties of the last salesman to visit the office. Evaluation consists of parallel testing a known or standard method, or known

Continued on page 162

Micros in the Emergency Department



by Robert Athanasiou, PhD, MD

Emergency medicine is one of the newest medical specialties; it is also one of the broadest. It deals with the acute management of trauma, heart disease, infection, and virtually any other disease in any organ of the body from amebiasis of the alimentary canal to zig-zag fractures of the zygoma.

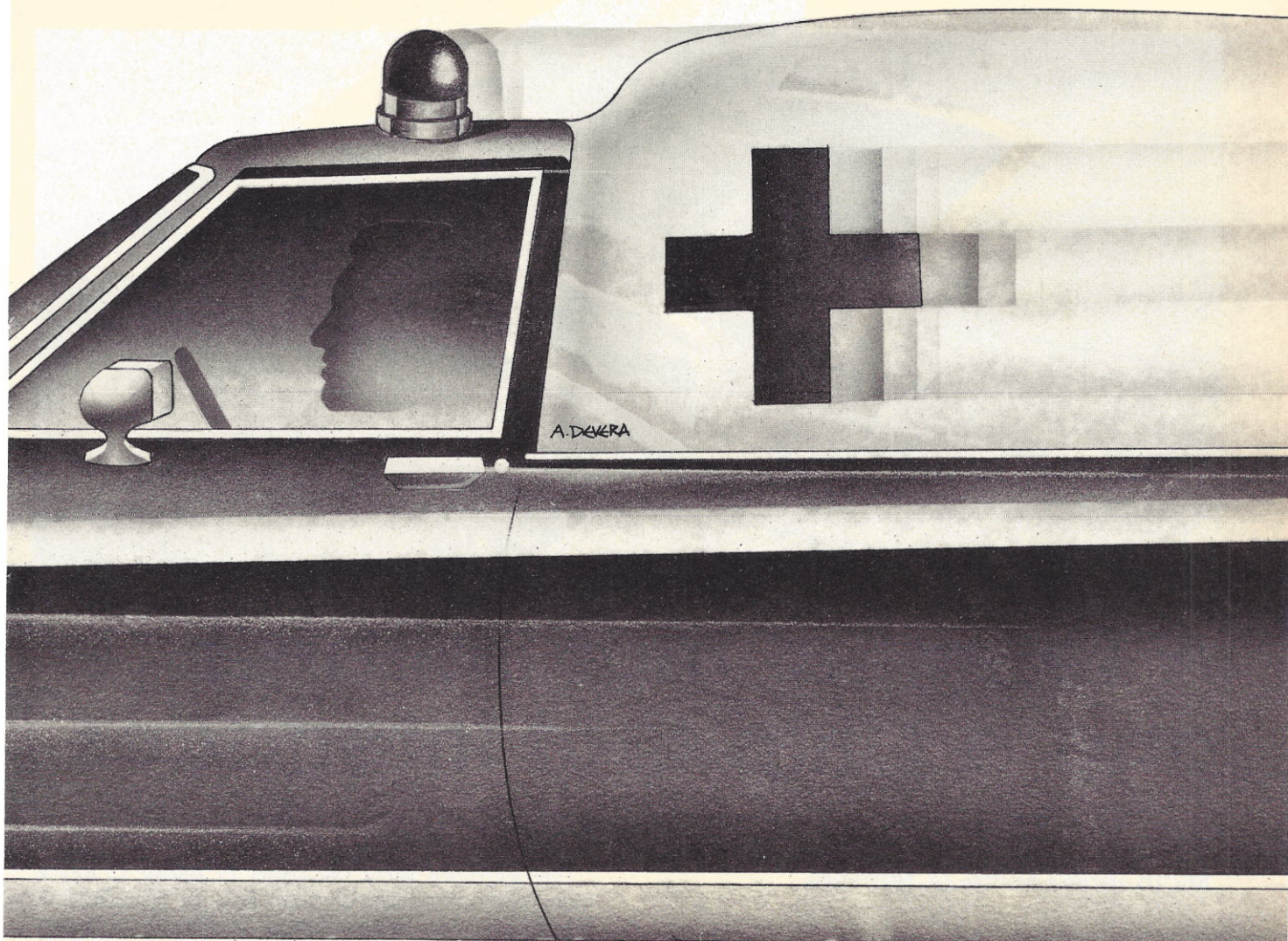
In many other specialties, the time available to reach a diagnosis may range from days to weeks. In contrast, an emergency medical decision based on a diagnosis must sometimes be made in minutes. This problem is compounded by the fact that symptoms may often be very vague. A patient with pain in his arm or shoulder might have a neck, joint, heart, lung, nerve or circulation problem. Data, gathered from history, physical examination and laboratory tests must be spliced together in an inductive chain to reach an exclusive diagnosis.

Computers are natural adjuncts to emergency medicine because they can be programmed to use easily obtainable and readily available data

in sorting through possible diagnoses. An unemotional computer can make the necessary calculations quickly and accurately every time. In the tense setting of a medical emergency, the savings may be in lives as well as time.

Metabolic analysis is one of the most common, yet complicated procedures in emergency medicine. Disturbances of the body's acid-base balance may be caused by disease, poisoning, trauma or the side effects of many medications. In virtually every emergency department in the country, a physician may rapidly obtain data on serum electrolytes and blood gases to evaluate the metabolic status of a patient.

Serum electrolytes are often abnormal in disease states but are rather general measures of metabolic functioning. They are the components of the salts, acids and bases that make up the fluid portion of the blood. Sodium (Na), chloride (Cl), potassium (K), and bicarbonate (HCO_3) are the major ones of interest. Sugar, in the form of glucose, and waste, in the form of urea (BUN), are also usually included in the automatic analysis performed in most hospital labs. Blood gases refer to the amount of oxygen (pO_2) and carbon dioxide (CO_2) carried in arterial



blood. The acidity (pH) of the blood is also included in these measurements.

Given these data and a little time, physicians can calculate certain metabolic indexes that indicate the body's deviation from a normal state. In some cases, the analysis is straightforward. In other cases, however, the use of charts and graphs may be required to correctly and reliably analyze data. Any task that is tedious and repetitious is better done by a machine than by a human.

Consider this example. An unconscious 52-year old male with a history of "the stomach flu" is brought to the emergency department. The patient is unable to give a history but a relative states that he has been "very sick for two weeks." Physical examination reveals normal color but rather dry skin and mucous membranes. His blood pressure drops when he is sat up. Blood samples are drawn and an intravenous line to supply fluids is started.

Laboratory data show a blood pH = 7.50, a $p\text{CO}_2$ = 48 torr, $p\text{O}_2$ = 90 torr, and HCO_3^- = 38 mEq/L. His electrolyte data are: Glucose = 82 mg/dl, BUN = 52 mg/dl, NA = 126 mEq/L, Cl = 70 mEq/L, K = 2.8 mEq/L and CO_{SB2} combining power (bicarbonate) = 38 mEq/L.

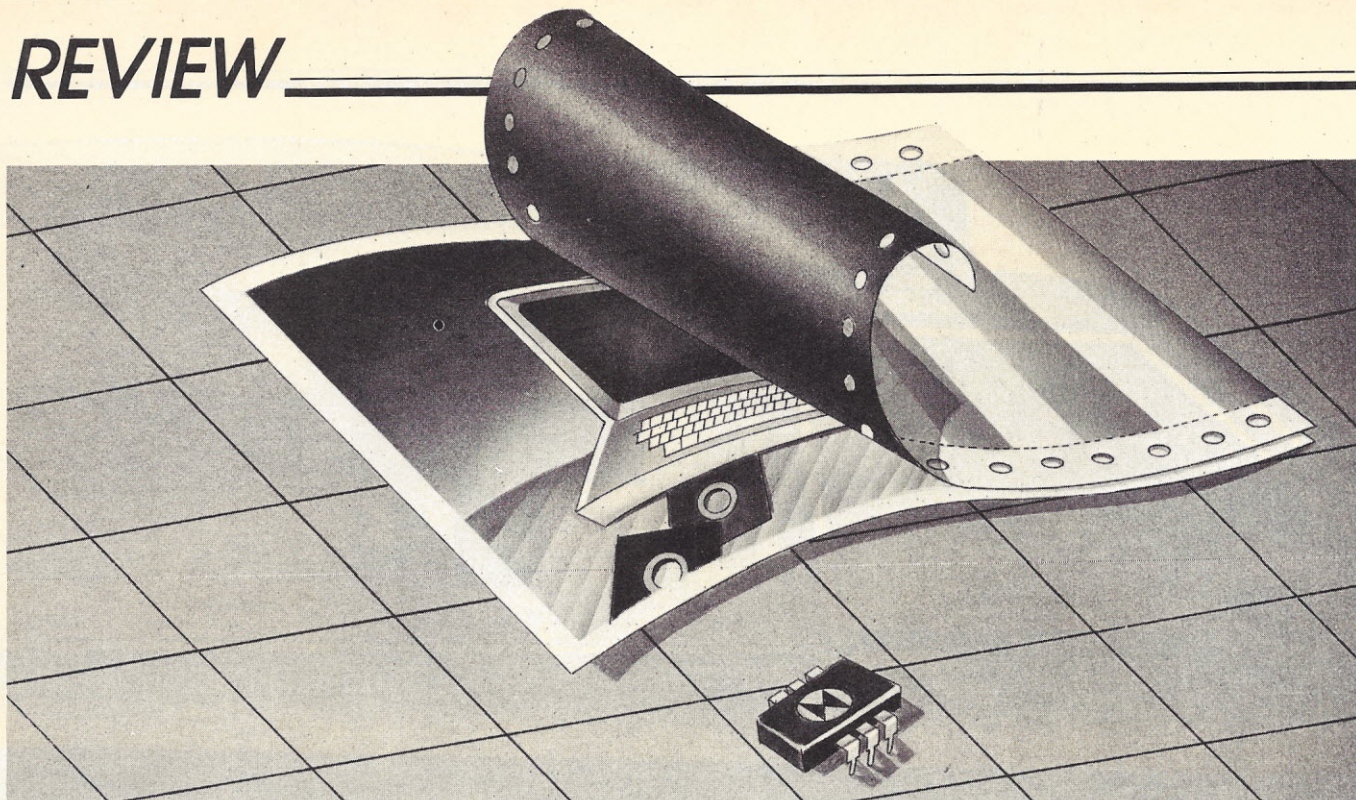
When these data are entered into the computer program, starting with the blood gasses, the first display is produced. His condition is immediately recognized by the program as Metabolic Alkalosis.

The prompt at the bottom of the screen is answered by pressing E, and the electrolyte data are entered. They produce a second output. Since the patient's data are so far from normal, the program suggests that you check to see if you have entered the data correctly. Answering the prompt with C produces the next display.

The third screen repeats the initial condition of metabolic alkalosis and suggests, in parentheses, some uncommon diagnoses. It then divides the remaining diagnoses on the basis of the results of a test of urine Chloride. At the top of the display, the electrolyte data are repeated and the anion gap is indicated.

The patient is catheterized to obtain a urine sample. The very scant amount of urine present shows a low Chloride level. This information, together with the history and physical examination, are consistent with a diagnosis of hypo-

Continued on page 168



A Terminal that Imitates... and a Chip that Interfaces

by Roger H. Edelson

Micro-Term's Mime-2A terminal

The Mime-2A from Micro-Term (St. Louis, MO) is an uncommonly universal terminal. Through the use of sophisticated software, the unit will mimic the Soroc I.Q. 120, the Hazeltine 1500, or the DEC VT-52 terminals.

Besides its value as an imitator, the Mime-2A is noteworthy in its own right—the general specifications are given in figure 1. The terminal will display 1,920 characters, arranged as 80 columns by 24 rows. Additionally, it has a simulated graphics mode, which provides 32 custom characters allowing the user to write fractions and to display bar and line graphs.

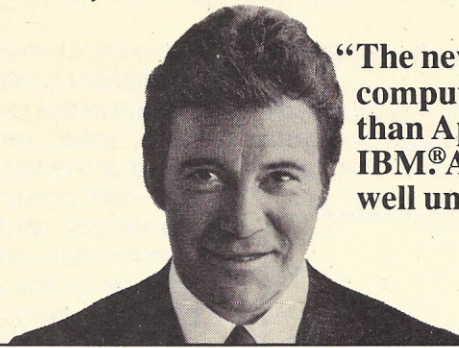
The Mime-2A provides most standard visual attributes, including reduced intensity, reverse and blinking video, single or double underline—plus smooth scroll. All four may be used in any combination, in any field. When using the smooth scroll feature, either the host computer must support the XON-XOFF protocol or data can be transmitted to the terminal at a rate no faster than five lines per second. If the XON-XOFF protocol is not supported, and data is transmitted at a rate greater than the five lines-per-second specification, the terminal will automatically revert to jump-scroll mode.

The terminal may be used in either a Block Transmission mode, or both Full- or Half-Duplex operation. The transmission interface is serial RS-232C with baud rates from 110 to 19,200. The interface also provides a 20 mA current loop capability, which further enhances its emulation capability. The Mime-2A also provides an additional serial port to provide either pass-thru (bidirectional) or buffered transmission to a printer. In the buffered transmission mode, the data rate to the printer is independent of the rate between the host computer and the terminal and is set up on the Mime-2A. In the pass-thru mode, the printer may communicate directly with the host computer so that the XON-XOFF communications protocol may be maintained.

Because of its "smart" emulation capabilities derived from an internal microprocessor, the terminal may—under optional specification—be customized to a particular application. One can specify emulation of an older or obsolete unit. This would enable one to save the cost of modifying all of a system's software to maintain compatibility with the new terminal. Alternatively, a user may have the function keys customized such that a bootstrap loading command, or a log-on sequence may be sent from the terminal by pressing a single key rather than a lengthy sequence of keystrokes. The keyboard layout illustrating the standard

COMMODORE VS. APPLE

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"The new Commodore 64 personal computer has 33% more user memory than Apple II+® and 300% more than IBM®. And, at an incredible \$595, it's well under half the cost."

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COMPARE OUR \$595 PERSONAL COMPUTER					
FEATURES	COMMODORE "64"	APPLE II+®	IBM®	TANDY TRS-80® III	ATARI 800®
Base Price	\$ 595	\$1530	\$1565	\$ 999	\$ 899
Advanced Personal Computer Features					
Built-in User Memory*	64K	48K	16K	16K	16K
Programmable	YES	YES	YES	YES	YES
Real Typewriter Keyboard	YES (66 keys)	YES (52 keys)	YES (83 keys)	YES (65 keys)	YES (61 keys)
Graphics Characters	YES	NO	YES	NO	YES
Upper and Lower Case Letters	YES	Not Included	YES	YES	YES
Maximum 5¼" Disk Capacity Per Drive	500K	143K	160K	178K	96K
Audio Features					
Sound Generator	YES	YES	YES	NO	YES
Music Synthesizer	YES	NO	NO	NO	NO
Hi-Fi Output	YES	NO	NO	NO	NO
Video Features					
TV Output	YES	YES	YES	NO	YES
Input/Output Features					
"Smart" Peripherals	YES	NO	NO	NO	YES
Software Features					
CP/M Option (Over 1,000 Packages)	YES	YES	YES	YES	NO
Game Machine Features					
Cartridge Game Slot	YES	NO	NO	NO	YES
Game Controllers	YES	YES	YES	NO	YES

*Each "K" equals 1,000 characters or digits of information. Disk drives and printers are not included in prices. Models shown vary in their degree of expandability.

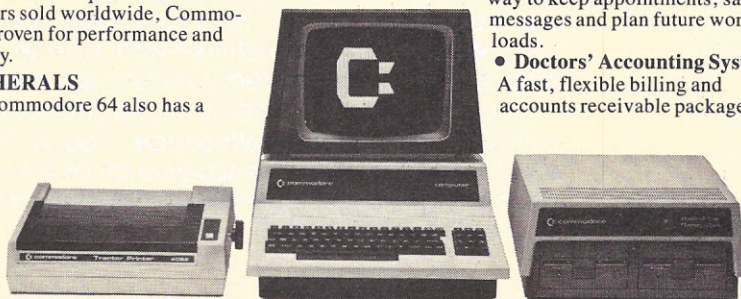
The new Commodore 64 may well be the most outstanding personal computer ever introduced.

It represents a breakthrough in microcomputer technology, with an amazing 64K of memory, and features not found in systems costing many times more. (See chart)

- How can Commodore do it? Commodore is the only U.S. personal computer company that manufactures its own microprocessors, the "heart" of all personal computers. (Commodore microprocessors are used in Apple and Atari computers, and many others.)
- Commodore is the only personal computer company with a full line of computers—from our \$299.95 VIC-20 to the remarkable new \$1995 Super PET that speaks 7 high-level computer languages.
- And with over a quarter of a million computers sold worldwide, Commodore is proven for performance and reliability.

PERIPHERALS

The Commodore 64 also has a



commodore
COMPUTER

full range of low-cost peripherals, including disk drives, printers and communication devices. Our low-priced telephone modem permits you to access data banks and interface with other computers.

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- **Electronic Spreadsheet:** Lets you plan budgets and explore all your financial alternatives in seconds. And with the optional graphic program, you can create bar and line graphs from your spreadsheet data.
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• **Legal Time System:** Automatically processes activities by client, attorney and action.

• **Accounting and Bookkeeping Systems.** Accounts receivable. Accounts payable. Payroll. Inventory control. Job costing. Engineering. Personnel recordkeeping. Tax preparation.

• **Video Games.** Challenging and exciting recreation for every member of the family.

• **Plus CP/M* Compatibility.** A simple cartridge enables you to run thousands of additional CP/M software programs.

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☐ Business ☐ Education ☐ Personal VIC-1A-9

assignments of the 16 function keys, as well as the other 72 keys, is shown in figure 2.

A superior design characteristic of the Mime-2A is its ability, when placed in the Display Code Mode, to display the ASCII symbol or symbols

CHARACTER SET:

128 (96 ASCII, plus 32 graphics)

CHARACTER TYPE:

Characters: 7-by-9 upper case 7-by-11 lower case (w/descenders)

Cursor: 9-by-12

CURSOR:

Reverse blinking block cursor, nondestructive, full intensity

BELL:

Audible alarm on receipt of CONTROL G

FEEDBACK:

Audible click from each keystroke

TAB:

Standard 8-column tab

INTERFACE:

Serial, asynchronous RS-232C or 20 mA current loop, compatible with bell modems 103 and 202. RS-232 auxiliary port.

DATA RATE:

110, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200

PARITY:

Odd, even, fixed or none

MONITOR:

High resolution 12-in. diagonal screen, P4 phosphor, non-glare screen.

SIZE:

17.0-in. W by 22.8-in. L by 14.7-in. H

WEIGHT:

37 lbs.

POWER REQUIREMENTS:

Standard: 115 volts, 60 Hz.

Optional: 220/240 volts, 50 Hz.

POWER CONSUMPTION:

50 Watts

OPERATING ENVIRONMENT:

Temperature: 5° to 50°C (41° to 122°F)

Relative Humidity: 5% to 95% non condensing

Specifications subject to change without notice.

Figure 1. General Specifications

representing the control/escape sequence codes either received or transmitted. This feature is particularly useful when trying to debug any format control problems caused by the transmission of unsolicited control codes. When transmitting text, the Display Control Mode allows control codes to be embedded in the displayed data for transmission

in the block mode to the host computer, or printer. This facility is particularly useful as it provides direct control of the printing attributes (compressed, bold-face, italics, etc.) of the Epson MX series printers.

Use of the terminal follows a familiar procedure. The host computer is linked to the appropriate connector and the baud rate set to the serial transmission rate. If desired, the standard factory settings for the keyboard auto repeat rate, cursor blink rate, field blink rate, underline style, keyboard click, and protected field may be changed by jumper selection before starting operation. The terminal emulation selection is commanded by two bits of a DIP switch located on the rear apron next to the baud rate selection DIP switch. Many of the features of the Mime-2A are not supported by the emulated terminals.

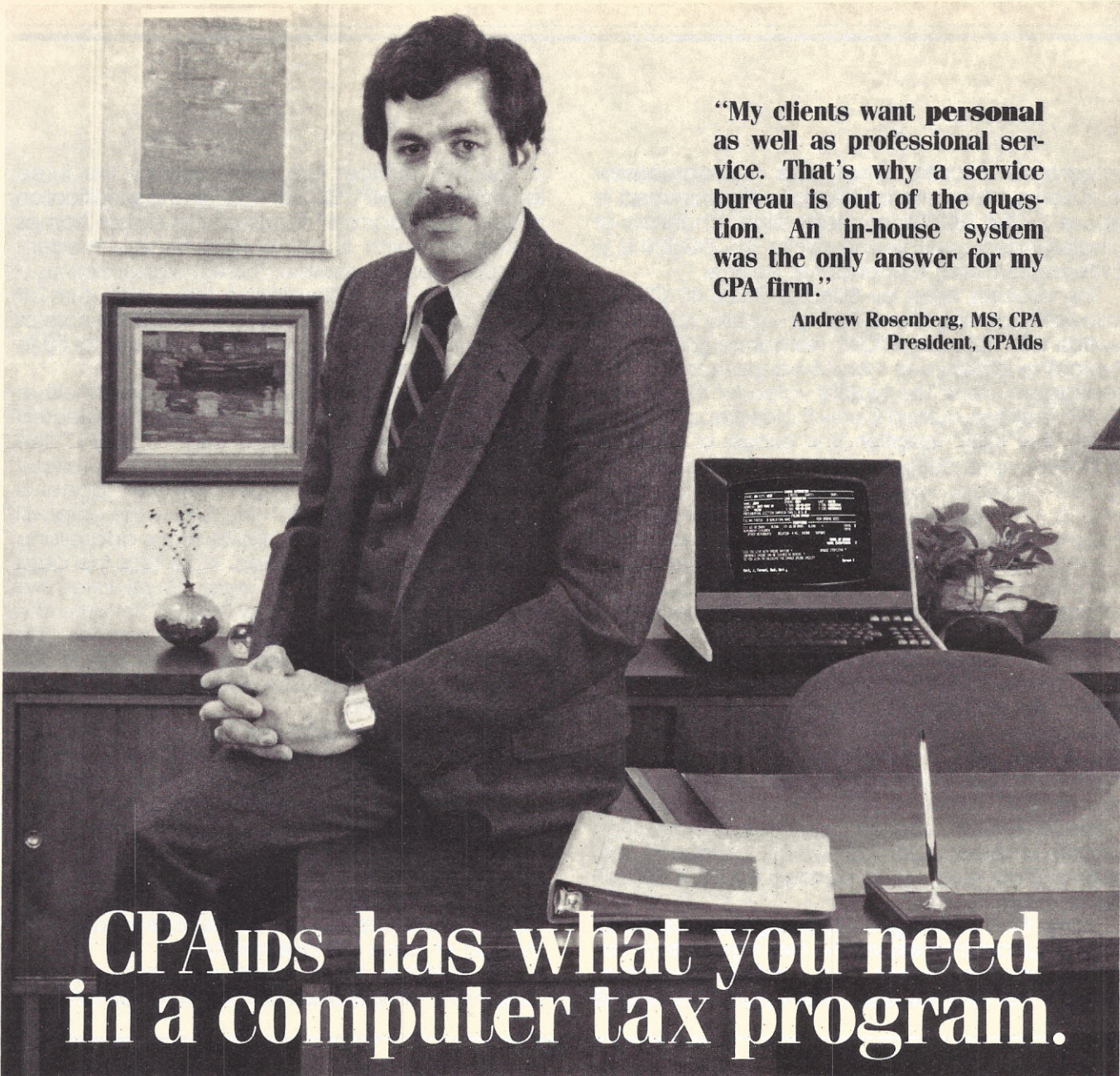
In order to use these attributes, it is necessary to command the terminal into its Enhanced mode through the appropriate setting of a single bit of this DIP switch. If use of these enhanced features causes problems, the standard emulation mode can be selected by repositioning this single-bit switch. This same DIP switch also allows selection and specification of the transmission mode and the serial I/O parameters.

The keyboard has a nice tactile feel. The audible keyclicks are useful feedback, and not objectionable. The monitor is a black-and-white P4 phosphor with an effective non-glare screen. The terminal did a fine job of emulating the DEC VT-52 and Soroc I.Q. 120 terminals, but when operating in the Hazeltine 1500 mode with WordStar, some operational difficulties occurred. It turned out the difficulties stemmed from sequences used to emulate the line-delete and line-replace operations. The technique was too slow to allow operation with the WordStar-generated commands used to scroll the screen. A pair of new ROMs, sporting redesigned control sequences solved this problem.

The Operating Manual is quite complete, but 1½ pages are devoted to changing the factory preset jumper settings and there is no picture or figure of the circuit board to help locate the jumpers. We suspect that the maintenance manual has the needed figure, but were never able to obtain one from Micro-Term. The main logic board is silkscreened with identifiers—with a little bit of detective work, the correct jumpers can be found. One commendable feature of the manual is the inclusion of the control/escape codes for the emulated terminals. This saves a lot of time when attempting to interface the terminal while imitating one of the other types.

Siliconix latchable multiplexers

Siliconix (Santa Clara, CA) has recently introduced its DG528 and DG529 latchable multiplexers. These



"My clients want *personal* as well as professional service. That's why a service bureau is out of the question. An in-house system was the only answer for my CPA firm."

**Andrew Rosenberg, MS, CPA
President, CPAids**

CPAids has what you need in a computer tax program.

"CPAids Master Tax program is probably the best known tax preparation program."

*PERSONAL COMPUTING
(December '81)*

"The program (General Ledger II) was written by Andy Rosenberg, who, as a practicing CPA himself, knew what accountants were looking for in a microcomputer program."

*INTERFACE AGE magazine
(April '82)*

Five years ago, with my tax practice steadily growing, I considered using a service bureau to process my clients' returns. The efficiency and accuracy that only a

computer can give held tremendous appeal.

However, I knew that my clients chose to come to me because of the personal touch my practice afforded them. I really had no desire to act as the "middle man" between my clients and a service bureau. The thought of sending my clients' confidential records outside my office was not really my idea of what a CPA firm was all about.

And yet I couldn't dismiss the advantages of a computer. So I wrote the program I needed—thus CPAids was born. During the past 5 years, our microcomputer software has enabled accountants throughout the nation to process thousands

of returns efficiently and personally in-house. With our **Master Tax**, **Corporate 1120**, **Tax Planner** and the interactive **General Ledger II**, you can be assured that we have all the programs to fit your needs.

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(216) 678-9015**

All programs require 48 Kb free memory; two disk drives, each 241 Kb preferred. CP/M 2.2® or MP/M® compiled ©Microsoft Basic. (®CP/M, MP/M are registered trademarks of Digital Research).

integrated circuits, which are microprocessor bus compatible, are functionally diagrammed in figure 3. The DG528 provides eight channels of single-ended multiplexing, while the DG529 is a differential (dual) four-channel device.

The process used by Siliconix (PLUS-40 CMOS) allows the construction of a high-quality solid state switch with 400 ohms "ON" resistance (270 ohms, typical) and between 1 and 5 nanoamps of "OFF" leakage current. The typical value for the Source "OFF" leakage current is only 5 picoamps. Dynamically, the "OFF" isolation is in excess of 68 dB at 500 KHz—an excellent specification. The process further provides true bidirectional switch action over a $\pm 15V$, single range, and allows a power supply voltage of up to 44V. Each of the logical/control signals is provided with input protection circuitry to minimize the susceptibility to static charges due to handling, or transients encountered during operation.

Equally as important as the "ON" resistance is the specification for channel-to-channel match. It is given as less than 6%. This parameter indicates how closely two different analog signals will track each other when multiplexed by this device into the finite impedance of the circuit used to accept the analog inputs. Further, the two multiplexers have a typical charge coupling specification of only 4 picocoulombs, which produces less than a 4 mv error when working into a 1,000 pF load capacitance.

While the switching/multiplexing parameters of this circuit are impressive, the real significance lies in the on-chip latches and control signals that make it bus-interfaceable. The operational states

of the two devices are controlled by the three logical signals WR^* , EN^* , and RS^* . In the specification sheets, the "barred" forms of the signal names are used, which is not consistent with modern microprocessor practice. The RS^* signal acts as a direct chip reset, simplifying the switch turn-off during system power up, or reset. While the normal time for this pulse is 1 μs , it must remain low for 50 μs after a power turn-on condition.

The WR^* signal places the multiplexer in either the transparent (WR^* low) or latches the selected "ON" device when brought high. The EN^* line functions as a chip enable—when low the circuit can not be changed, and if the WR^* signal is brought low when the EN^* line is low, the chip will be cleared. This feature allows a bus addressing structure to be implemented. Note that the data must remain valid for at least 30 nS after the WR^* signal has transitioned "HIGH," to write the selected switch configuration to the latches. The design has been optimized such that only a 300 nS WRITE pulse is required, allowing compatibility with 3 MHz systems.

Figure 4 presents a typical application diagram for the DG528. In this case only three (or four, if the enable line is not externally decoded) data bus lines are used. The diagram shows a separate address bus, which is decoded to provide the enabling of WR^* . Other techniques could use bits of the data bus to determine if the particular chip was to be selected for addressing. These higher order bits would be routed to the address decoder instead of using the address bus.

The DG528s have been designed into an automatic temperature controller for an array of

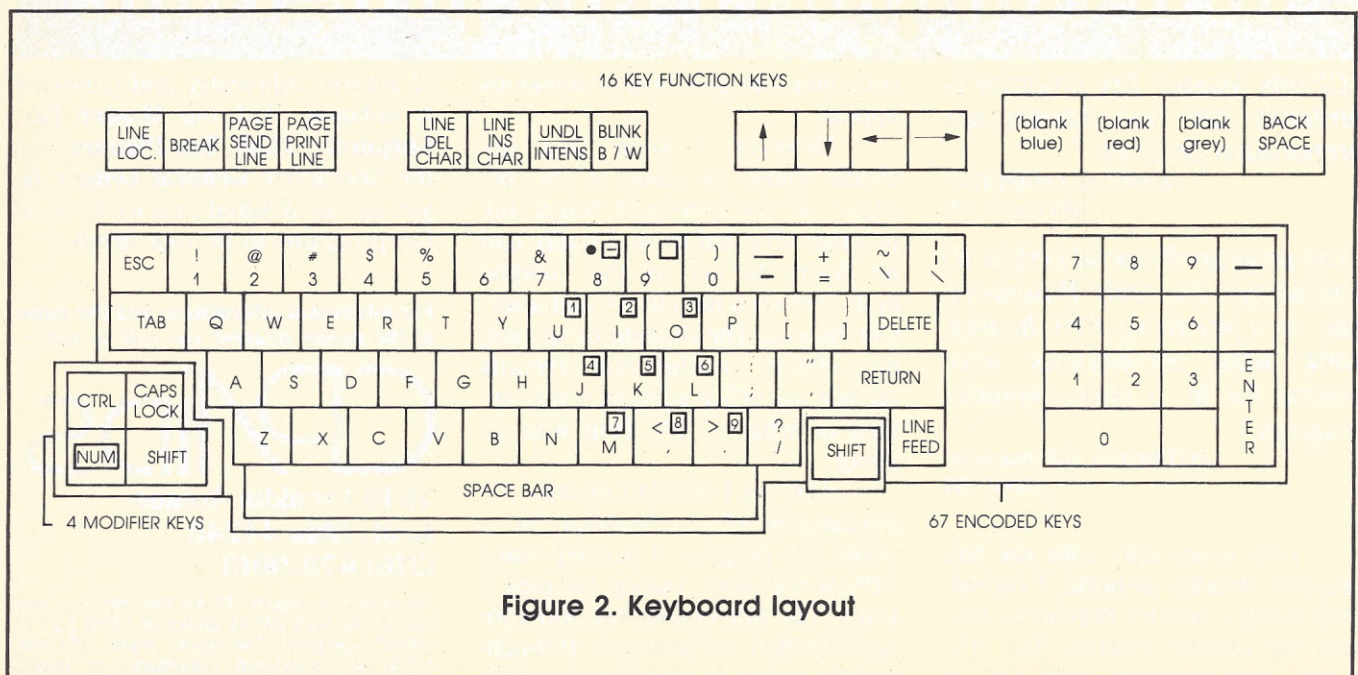
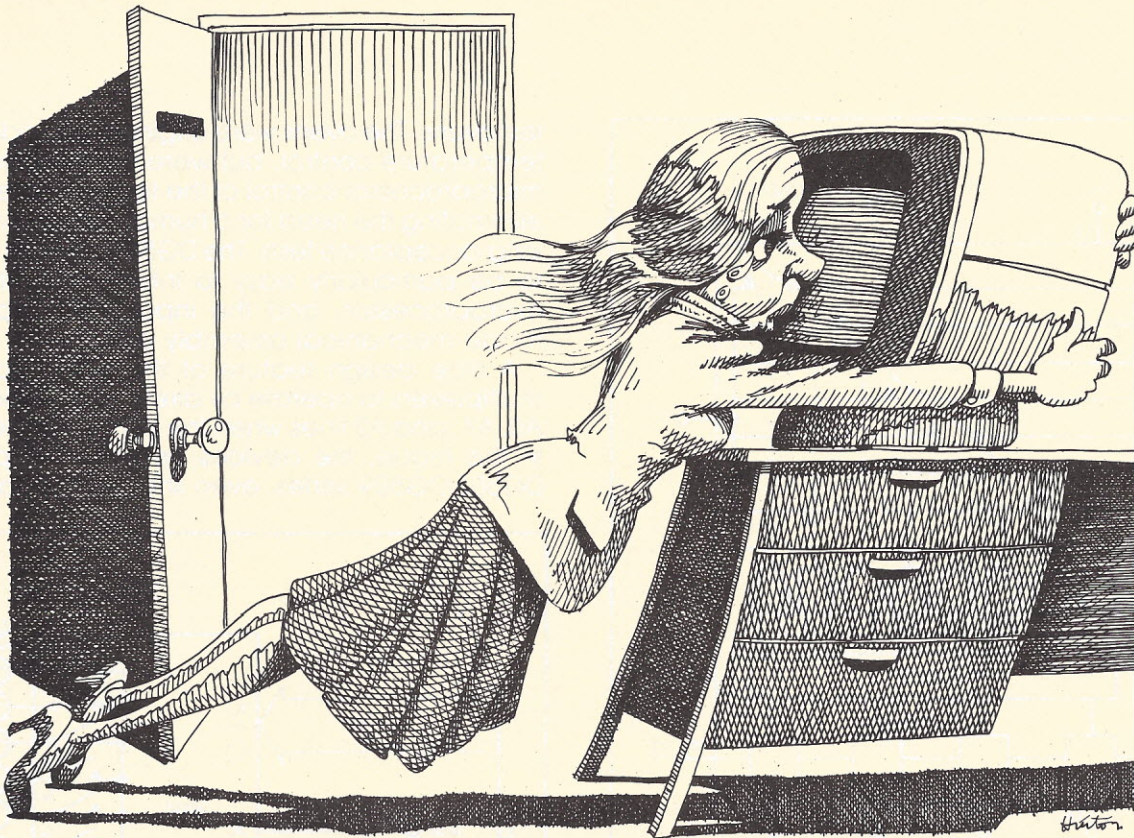


Figure 2. Keyboard layout



“I got my promotion, but I can’t bear to leave my Ampex terminal.”


You can’t blame her. You can get awfully attached to an Ampex D81 terminal. Maybe it’s the convenience of the detached, familiar Selectric-style keyboard. Or the beauty of the distinctively designed profile. But we think it’s really the sum of a lot of ergonomic features that make this buffered editing terminal so desirable: conversational or block mode operation. Non-glare 12” diagonal screen with amber, green or white phosphors. Two or four pages of displayable memory. Twenty programmable function keys. Complete range of visual attributes.

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No wonder the D81 is so hard to leave behind. But take heart. Remember, as far as this Ampex terminal is concerned, when it’s your turn to be called upstairs — you really *can* take it with you.

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Data Systems of Baton Rouge, LA (504)923-0888 □ Micro Computers of New Orleans, Inc., LA (504)885-5883 □ S & S Electronics, Inc., MA (617)458-4100
Computer Solutions, Inc., MI (313)588-1998 □ Washington Electric Co., NY (212)226-2121 □ A.C.S., Inc., PA (215)947-5590 □ Interfaces Ltd. Corp., PA (412)941-1800
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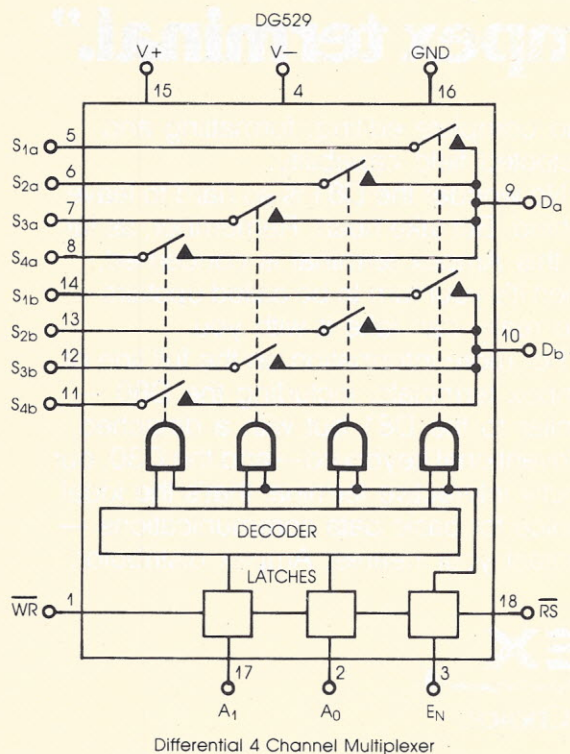
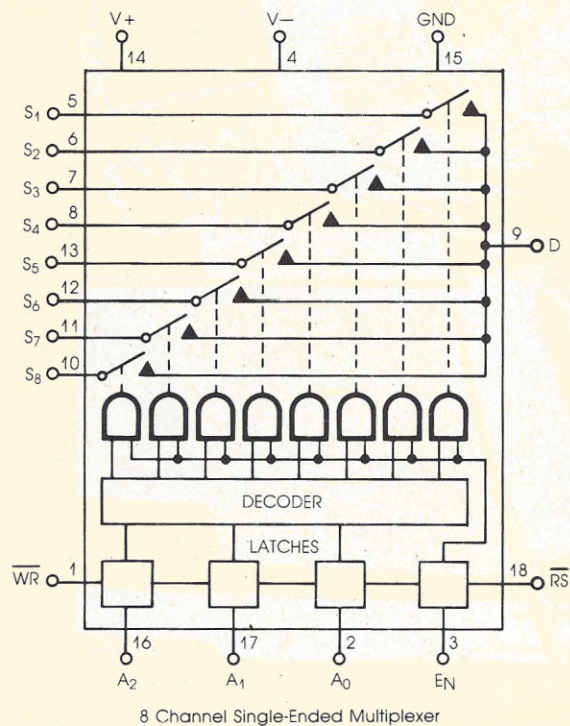
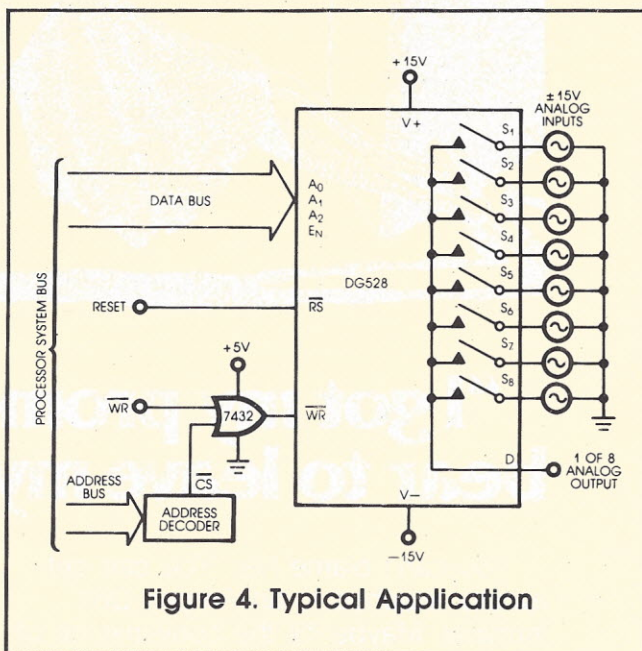


Figure 3. Functional Diagrams

test ovens. The ovens were originally all under local temperature control, but were modified to allow microprocessor control of the temperature profile eliminating the need for a human operator during long acceptance tests. The DG528 devices proved to be particularly easy to interface to the host microprocessor, and the input/static protection made mechanical assembly easy.

A nice design feature of the chip allows the multiplexers to operate by direct command of the A0, A1, and A2 lines when the WR* line is held low. In this mode, the devices emulate the popular DG508/DG509 series, even sharing the same pin



arrangement. While the logical signal input circuits are not TTL (the device is CMOS), they are TTL-compatible by virtue of the threshold voltage generator and the comparator circuitry. This design maintains TTL logic levels, while providing an extremely light circuit loading, only 30 microamps maximum, which allows a large number of devices to be paralleled on the data/address bus. In general, a significant amount of attention has been devoted to making these multiplexers easy to use.

Contributing editor Roger H. Edelson's experience in the electronics industry has included analog circuitry, analog computation, digital design and, most recently, design and development in the field of microwave communication circuitry. He has been with Hughes Aircraft for more than 20 years, during which time he has been Group head of the Memory Circuits Group, and Senior Project Engineer with responsibility for the technical and financial development of the F-14 Computer Subsystem.

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for CP/M 86

MODE=NORMAL ORDER=R/O ROW=1-50

ROW 1 (Net Sales) <--
ENTER COMMAND:

ROW	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	
---	1---	2---	3---	4---	5---
1 Net Sales	1,000.0	1,100.0	1,210.0	1,331.0	4,641.0
2 Cost of Good	450.0	489.5	532.4	579.0	2,050.9
3 Gen & Admin	200.0	220.0	242.0	266.2	928.2
4 Res & Develo	300.0	350.0	400.0	450.0	1,500.0
5 Total Costs	950.0	1,059.5	1,174.4	1,295.2	4,479.1
6 Gross Profit	50.0	40.5	35.6	35.8	161.9
7 % Profit	5.0	3.7	2.9	2.7	3.5
8	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0
10 % C.O.G.S.	45.0	44.5	44.0	43.5	0.0
11	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0

44 ADD
45 NEGATE
46 INVERSE
47 INTEGER
48 ROUND
49 CUMULATE
50 ABSOLUTE
51 ADD K
52 SUB K
53 MULT K
54 DIV K
55 SUM
56 GET
57 ZERO
58
59

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The Otrona Attache

by Dona Z. Meilach

The Attache portable computer by Otrona (Boulder, CO) offers some intriguing possibilities for the businessperson. Imagine making a pitch to a client about how your services would increase his profit and market saturation. You need something to help make the presentation memorable. What can you do?

You lift the lightweight portable case you carried into his office and place it on the desk in front of him. Quickly, you unsnap the lid, flip it over to reveal a keyboard. You deftly push in the knobs and swivel the handle beneath to prop the unit before him. You are about to perform electronic wizardry and business magic. As he watches in amazement, you engage a 5.25-in. floppy disk in each of the two disk drives next to the screen, pull the keyboard towards you on the extension cable and hit a couple of buttons.

You've already got *his* figures for *his* business: nothing hypothetical or general. You feed the data to answer the prompts on the screen, deciding if you want to illustrate them with a bar, pie or line graph. And faster than your hand could scratch it out on paper, there—on the screen—appears a sophisticated visual display delineating whatever projections are desired.

After closing the sale, do you shake hands on the deal and tell your client you'll go back to the office and prepare a contract? You can do better than that. On your magical green screen, you invoke the word processing program, draft the contract and make certain all points are read and understood. If you brought a printer, you print the graphs and contract, leaving copies with your client without further delay.

But you don't have to take the printer; all the information can be saved on disk. Back at your office, you review it all, add any details to help clinch the sale, then mail your client copies for final approval. You've outstripped his competition—and your own.

The Attache is an attractively packaged self-contained system in a white and light brown rugged metal case. Weighing in at only 18 lbs., it is readily transportable from a car to an office. Overall size is 6-in. high, 12-in. wide, 13.6-in. deep plus the easy-grip handle, which becomes the

adjustable support for the open unit. The keyboard is held to the body by two briefcase-like snaps and it lifts off like a lid. Keyboard and unit are interfaced with a coiled cord that allows it to be used up to 10 feet away from the unit.

You will have to augment the unit by carrying the electric cord, disks, and cables (if you'll use a printer on site) in another package. Optional items might include communications cables, a separate battery and charger unit capable of powering the unit for up to 1½ hours and a fitted carrying case. The system will be unobtrusive and convenient on a desk in home or office. It can travel easily on an airplane, taking about the same space as a small electric portable typewriter.

The components of the unit are as impressive as its portability and design. The 64-key Selectric-style typewriter keyboard has three codes for each function key. The green non-glare 5.5-in. (diagonally measured) CRT screen displays 80 characters by 24 lines. Next to it are two built-in double-sided 5.25-in. disk drives with 360K-byte capacity each. Diskette format consists of ten 51K-byte soft sectors per track with track density of 48 tracks per inch.

There is a Z80A main processor with a 4MHz clock; 64K bytes of read/write memory, and 4K bytes of read-only memory. An additional 14K bytes of graphics and display memory is completely independent with 10K allocated for graphics representation and 2K for alphanumeric data and a corresponding 2K for the display attributes of the 1920 display characters.

Two identical ports at the back of the unit are compatible with RS-232C, RS-422, and RS-423 standards. The cables—not included—enable interfacing with a modem and a printer simultaneously. The communications ports support synchronous, bisync, monosync, HDLC, SDLE and other protocols. A standard RCA connector that will support an external CRT or projection video display for larger screen viewing is built-in.

Unique to the Attache in the portable computer category is its ability to handle and display full bit-mapped graphics. The 320 dot-wide, 240 dot-high array (76,800 points) fills the entire screen. Both graphics and alpha-numerics can be displayed

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When the screen looks like the format you want, type "/S" and what you see is what you'll get. In seconds, ZIP writes all the program code to recreate the format on the screen or on paper.

And you can use the ZIP code immediately just by adding a single line to your main program: GOSUB xxxxx in BASIC, DO Formname in dBASE II.

ZIP is quick and friendly.

ZIP runs on virtually every 8-bit micro known to man, and your terminal continues to work the way it did (tab, arrows, etc.), so you don't have to learn or unlearn anything about your equipment.

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The ZIP Talker,TM a line at the bottom of the screen, always tells you exactly where you are. And Help is just two keystrokes away.

Now MBASIC really ZIPs.

The MBASIC version goes further and gives your programs the same screen handling characteristics that ZIP has, by writing a piece of itself in MBASIC so that you can use it in any of your programs.

The operator can use the arrows, etc. during data entry and conveniently jump back and forth between the input fields.

You can specify field lengths, or let ZIP default to the available space. Either way, text and prompts are protected no matter what kind of terminal you have, so the operator can't write over the fields and prompts.

The image shows a stack of various business forms. From top to bottom, they are: W-4/EE'S WITHHOLDING, INVOICE, AIRBILL (with a date of 3/68 and a number 3685702), STATEMENT, COMMISSION REPORT, and PURCHASE ORDER. Each form has its title prominently displayed at the top.

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CUSTOMER NAME: ;Customer\$ DATE: @Date
 MAIL ADDRESS: ;Addr1\$;30
 CITY: ;Addr2\$
 STATE: ;Addr3\$ ZIP: ;Zip1:5
 SHIP ADDRESS: ;Addr4\$;30
 CITY: ;Addr5\$
 STATE: ;Addr6\$ ZIP: ;Zip2:5
 DISCOUNT CATEGORY: ;Rate!

THE CODE FOR THIS NEW CUSTOMER IS @CustCode.

Row 17, Col 36

You get the MBASIC code for a "Talker" that you can use to pretty up your program prompts. And easy, one-line data validation is built in.

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The MBASIC and CBASIC versions are \$160 each (\$225 for both) plus \$7 shipping (VISA, MasterCharge or money order). The dBASE II version is available alone from Ashton-Tate (213-204-5570), or we'll sell you dBASE II with ZIP for \$650. For more information, contact Nexus, 5455 Wilshire, Suite 802, Los Angeles, CA 90036.

Or if you'd like to end the paper chase sooner, just call 800-227-3747. (In California, call 213-937-0554, add 6% tax.)



from **Nexus**
 The man-machine connection.

simultaneously. Because of the small screen size and its engineering, the graphics resolution is sharp and clear. Programming the displays is irresistible.

The documentation with the test model was hazy for use of the Charton and its graphic modes, but the few programs we were able to produce were astonishing. We created bar, pie and line charts, and free-form figures. The response time was noteworthy; a bar graph appeared almost instantaneously in answer to the XY coordinates fed into it. We could scroll characters through and around the graphic image created. An AM9517A direct memory processor handles the disk and communications port operations to allow incredible speed. None of these facilities tax the 64K bytes of processor memory.

The unit also supports underlining, super- and sub-scripts, boldface, strikethrough, double size characters, reverse video and highlighting. Greek alphabet characters, mathematical symbols, and symbols to complete German, Spanish, French, Italian, Swedish and other alphabets. There is a total of 256 character types.

Valet, another feature unique to the Attache lets you interrupt one task while you perform another independent task. You can, for example, be

creating text under WordStar, shift to a calculator mode to perform a computation and come back to the text without missing a beat—or even handle communications traffic while editing text.

The DMA processor permits the Z80A processor to continue with its high speed processing after the Z80A has issued a command to the DMA processor to fetch or put data to the disk or communications port. The net effect is improved disk response speed and simultaneous gathering and processing of data. The system employs REMEX RFD480/960 disk drives, which use a split band/stepper motor system: it moves the head with a track-to-track access time of only 5 mS and contributes to the speed at which all material is accessed. The unique sector formatting allows the system to read a full 10-sector track in only two revolutions—five times faster than with typical disk formatting, which requires ten revolutions.

The built-in features particularly liked by test users were the ability to toggle in and out of such personal preference modes as the brightness and contrast of the screen, the volume of feedback sounds of the keyboard to deaden or change from a "dink" to "click" or two tones of "beeps", to change communications and printer transmission rates from 75 to 19,200 baud. A time-of-day clock

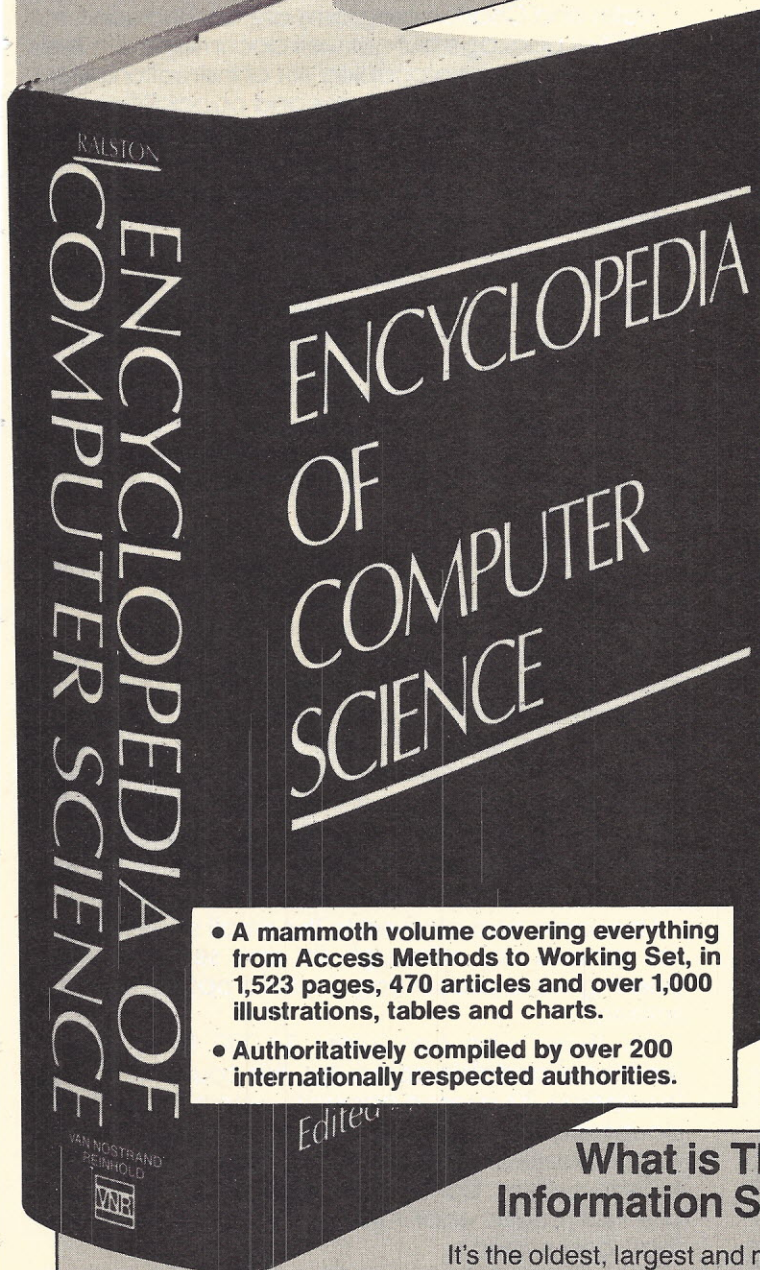
Feature-by-feature comparison: Osborne 1 and Attache

	<i>Osborne</i>	<i>Otrona Attache</i>
Price	\$1,795	\$3,995
Processor chip	Z80A	Z80A
RAM	64K bytes	64K bytes
Disk storage capac.	100K per disk	360K per disk
Disk drives	two single dens.	two double dens., double-sided
Display unit	5-in. b/w	5.5-in. green filter
Character display	52 by 24	80 by 24
CRT features	Upper/lower Reverse video	Upper/lower, reverse video, Superscript, graphics, subscripts, boldface, underscore, strike-through, double-size
Monitor jack	non-standard	Yes
Total # of keys	68	64
Detach Keyboard	Yes	Yes
Graphics capability	No	Yes
# of pixels	None	320 by 240
Real time clock/cal.	No	Yes
# of ports	1 RS-232 1 nine-pin modem 1 IEEE 4888 1 for battery pack	2 ports supporting RS-232, 422, 423
Video jack	Optional	Built-in RCA
Built-in speaker	No	Yes
Sound synthesizer	No	Yes
D.C. Operation	Yes	Yes
Portable	Yes	Yes
Weight	23.5 lbs.	18 lbs.
Size-height	9-in.	5.75-in.
width	20.5-in.	12-in.
depth	13-in.	13.6-in.
Cubic feet	1.39	.5
Battery option	Yes	Yes
Programs included	WordStar 2.6, Mail-Merge, SuperCalc, MBasic, CBasic, CP/M	WordStar Plus 3.0, Basic 80/w. graphics extensions, Charton, Valet, CP/M

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keeps track of time and date even when the power is off so that there can be an automatic logging of accounting documents and program listings.

The keyboard also has notations above the numeral keys indicating multi-functions. Some commands of WordStar normally requiring two keys are performed with a single specifically programmed key. The FIND command, for example, is invoked by hitting the ^- as opposed to the ^QF in normal WordStar usage. The keyboard does not have a separate numeric pad—instead a toggle with Control and CAPS LOCK lock activates the keys below the numerals 7, 8, and 9, to become digits. The letters U, I, O become 4, 5, 6 and so on down the next two rows to emulate adding machine key positions.

Keys have good rollover ability and we could type as rapidly as on a larger board with no loss of typing speed. The manufacturer reports that it is capable of handling words typed at the inhuman speed of 735 words per minute. There's a 16-character type-ahead buffer. Displays change rapidly on the screen, thanks to the 18MHz CRT.

Only a couple of the keyboard features were annoying—probably due to finger habits fostered by more familiar units. The "Caps Lock" key is a toggle; rather than push it down to lock in the capital letters, you push it once for caps, once again for lower case letters. The return and control keys are the third row up on the keyboard while a typewriter and our own terminal have them in the second row. This might require some adaptation, even more so if it were a "second" or "travel" computer.

The 5.5-in. screen displaying 24 lines of 80 characters results in a small type size, which is not the easiest to read for long time periods. A double size format is available, which would alter the display to 24 lines of 40 characters. Attache publicists argue that the 24-by-80 line display is really advantageous, contending that the shorter left-to-right eye scan is easier. Initially, the reaction is that the small type and screen would reduce your eyes to pin points, but in use, it is not that objectionable; the body accommodates. The obvious solution is to use a larger monitor for long sessions if the small display causes fatigue.

The Attache is designed to operate with CP/M and UCSD Pascal operating systems. It will accept any software written under these systems and supplied on a 5.25-in. disk. Attache-formatted software with CP/M is available from two companies: Software Distributors (Culver City, CA) and Soft Link (Los Altos, CA).

Included with the Attache are the CP/M operating system and utility programs, Micropro's WordStar Plus for word processing, a version of Microsoft's Basic that will support standard Basic 80 plus

graph plotting commands including point plot vectors, block plots with block and polygon fill commands. WordStar and Basic are supported with an Attache version of the manual of each program, along with a copy of *CP/M Handbook with MP/M* by Rodney Zaks (Sybex, Berkeley, CA).

Valet and Charton programs are also included in the initial package but not well-documented in the test model. The photocopied set of instructions was ambiguous. As the programs and capabilities are finalized, a more lucid set of instructions should be available. Anyone starting out with the Attache as a first computer would probably be confused as to which book to begin with. Initial set-up and turn-on instructions appear in the WordStar-Plus manual.

The system, with hardware and software, sells for \$3,995. The options, as they become available are now quoted as \$395 for the DC power adapter; \$295 for the five pound strap-on battery pack and recharger for 90 minutes of service; \$295 for a STD-A80A expansion bus adaptor; and \$49 for a pouch to carry the accessories. Several configurations of an add-on multi-function board are also available.

What were my overall impressions? When I first opened the box, I felt an ambivalence. How could so little a package cost and be worth nearly \$4,000—about half of what my "big" computer system costs? After working with the system, ironing out the wrinkles and accepting the differences, I became more enthusiastic—especially about the graphics capability. I couldn't wait to write the programs that would input circles and squares and circles within squares. I regretted that I did not know how to address all the pixels; I wondered if I could write a subroutine to achieve a three-dimensional graphic output.

I became accustomed to the small screen (with my glasses on), although for any serious, long-peering word processing, I would opt for my big screen.

For those who can justify \$4,000 for a multi-functional portable computer, this could easily be the choice. It's a large-capacity system that will undoubtedly provide years of dutiful service. It is not expandable or perhaps not as "heavy-duty" as a full size system, but it's not meant to be. Its virtues are that it does what it says—and it delivers more than one expects.

The most obvious questions are: How does it compare to the Osborne 1 (that sells for \$1,795)? What makes up the difference of \$2,200? Is it worth it? Only a hands-on demonstration of each—based on a specific application—will yield a suitable answer. As other portables are introduced, compare them feature-for-feature.

The accompanying chart demonstrates some of the criteria that should be employed in a comparison between two systems. □

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4	19	34	49	64	79	94	109	124	139	154	169	184	199	214	229	244	259	274	289	304	319	334	349
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12	27	42	57	72	87	102	117	132	147	162	177	192	207	222	237	252	267	282	297	312	327	342	357
13	28	43	58	73	88	103	118	133	148	163	178	193	208	223	238	253	268	283	298	313	328	343	358
14	29	44	59	74	89	104	119	134	149	164	179	194	209	224	239	254	269	284	299	314	329	344	359
15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	360

Please complete the following information: (ONE check per question)

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 - ☐ Accounting
 - ☐ Engineering
 - ☐ Marketing
 - ☐ Manufacturing
 - ☐ Research & Development
 - ☐ Sales
 - ☐ Training
 - ☐ Other
- My present title is:
 - ☐ President/Owner
 - ☐ Vice President
 - ☐ General Manager
 - ☐ Sales Manager
 - ☐ Marketing Manager
 - ☐ Production Manager
 - ☐ Research & Development Manager
 - ☐ Administrative Manager
 - ☐ Other
- I need this information for:
 - ☐ Immediate use
 - ☐ Within 30 days
 - ☐ Within 60 days
 - ☐ Within 90 days
 - ☐ Within 120 days
 - ☐ Other
- My company is:
 - ☐ Manufacturer
 - ☐ Distributor
 - ☐ Retailer
 - ☐ Service Provider
 - ☐ Other
- I use my computer for:
 - ☐ Accounting
 - ☐ Engineering
 - ☐ Marketing
 - ☐ Manufacturing
 - ☐ Research & Development
 - ☐ Sales
 - ☐ Training
 - ☐ Other
- My computer system is:
 - ☐ IBM PC
 - ☐ IBM XT
 - ☐ IBM AT
 - ☐ Apple II
 - ☐ Apple III
 - ☐ Apple Macintosh
 - ☐ Other
- My company size:
 - ☐ 1-99
 - ☐ 100-499
 - ☐ 500-999
 - ☐ 1,000-4,999
 - ☐ 5,000-9,999
 - ☐ 10,000-49,999
 - ☐ 50,000-99,999
 - ☐ 100,000-499,999
 - ☐ 500,000-999,999
 - ☐ 1,000,000 or more

BUSINESS SOFTWARE

Enhanced database package

North Star has reached agreement with Ashton-Tate, developer of dBASE II, to implement several changes to the application package. Modifications provide greater system security for executing dBASE II command files; expanded cursor functions for screen format control; and the tailoring of the full screen mode to use maximum graphics video display. North Star, San Leandro, CA.

CIRCLE INQUIRY NO. 150

Accounting package

Menu-driven software for Fortune 32:16 system consists of seven modules: order processing, accounts receivable, purchase orders, accounts payable, payroll, fixed assets and general ledger. Each is capable of operating by itself in a stand-alone configuration or with the other modules in a fully integrated package. It is part of Fortune's multi-user business system, which can also include word processing and business graphics and can simultaneously support multiple users of the business applications, word processing and other application packages. Users can combine capabilities of several packages in generating a single document. Fortune Systems, San Carlos, CA.

CIRCLE INQUIRY NO. 151

Fortran for TRS-80 III

Included in this package are an editor, a compiler and a linker plus a subroutine library—on a 5.25-in. floppy diskette. It requires a 48K-byte two-disk TRS-80 Model III for operation. A similar package for a

32K-byte two-disk Model I is also available. Tandy Corp., Fort Worth, TX.

CIRCLE INQUIRY NO. 152

Electronic worksheet

The Magic Worksheet spreadsheet has enhanced data entry features including menus of system functions and commands, and prompts to the user for specific information or commands. Different column widths can be specified within the same worksheet. Structured Systems Group, Oakland, CA.

CIRCLE INQUIRY NO. 153

System for insurance agents

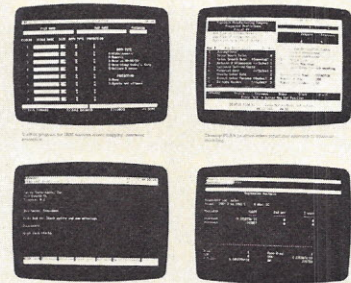
The Top Producer provides basic client/prospect information such as address and birth date, as well as an analysis of client financial needs and illustrations of insurance program alternatives. Program alternatives include such traditional products as participating whole life and non-traditional products (universal life). The basic configuration consists of a 128K-byte, 16-bit IBM microcomputer, two IBM floppy disk drives and an 80 characters-per-second IBM printer, with software for client/prospect retrieval, financial needs analysis and sales illustration of traditional life insurance programs. Programs include participating whole life, nonparticipating whole life, term insurance, annuities, vanishing premium, split dollar, flexible deposit, deferred compensation and executive bonus. Informatics General Corp., Dallas, TX.

CIRCLE INQUIRY NO. 154

New VisiSeries for IBM PC

Four members of the VisiSeries personal computer software from VisiCorp are

joining the company's VisiCalc program on the IBM. They are the VisiFile, VisiTrend/Plot, VisiDex and Desktop/Plan. Each has



been customized to take advantage of such IBM features as 80-character-wide display, high-resolution graphics, full keyboard and function keys. VisiCorp, San Jose, CA.

CIRCLE INQUIRY NO. 155

Word processor for Apple

Pie Writer, based on an earlier word processing program, has been updated. It is made for the standard 40-column board but can also be used with an 80-column board. A machine buffer has been added so text can be entered as the machine is scrolling. Multiple tabbing capabilities allow the cursor to stop at the beginning of each word, not only at set stops. An entire screenful of text is displayed instead of one line at a time. A single command allows placement or correction of characters, words, sentences and paragraphs. There is an automatic paragraph indenting mode. A global word search allows the place-

ment or correction of words throughout an entire document. The formatter, used to determine how the printed text will appear, now has incremental spacing. Hayden Book Co., Rochelle Park, NJ.

CIRCLE INQUIRY NO. 160

Medical system

Medsafe warns physicians of potentially adverse drug reactions before they prescribe medication. It also stores and

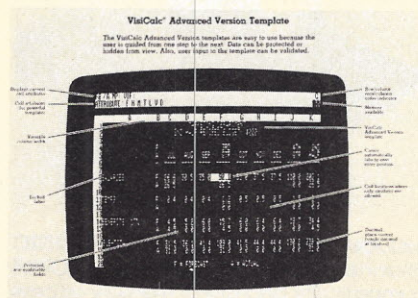


automatically updates patient medical records, carries out accounting, patient billing, and third-party billing functions. It provides physicians with rapid visual access to the potentially adverse interaction patterns of more than 6,000 prescription drugs, non-prescription drugs, and foods. The system consists of three basic components: the terminal unit, which includes the computer, keyboard, and display screen; the high-density storage unit, with a capacity of 20 million characters (6,000 printed pages); and the printer unit. Compunet, Los Angeles, CA.

CIRCLE INQUIRY NO. 156

Advanced VisiCalc version

This second-generation electronic spreadsheet program brings to an organization the capabilities that the original VisiCalc program brought to the individual user. Enhancements include complex formulae handling, financial functions, and potential for sophisticated templates. In addition, help and protection facilities guide a



new user step-by-step through the model. It requires an Apple III with 128K bytes of memory, a monitor and one disk drive. A printer is recommended. Versions for

other personal computers will be announced as they become available. VisiCorp, San Jose, CA.

CIRCLE INQUIRY NO. 158

Word processing system

Word Right runs on CP/M microcomputers and uses simple, English-like commands, allowing users to learn and operate the system easily without having to memorize unfamiliar commands. Page length, number of text lines per page, number of lines per inch and number of characters per inch can be controlled. Single sheets or continuous forms can be printed in true proportional spacing. The user can choose from a large number of special tab functions. Structured Systems Group, Oakland, CA.

CIRCLE INQUIRY NO. 159

Investment analysis package

Performance Measurement System is a set of VisiCalc templates for measuring the rate of return-of-investment portfolios. The central feature of the new system is that it calculates the true internal rate of return of a portfolio for short periods of time. Those returns are then used to calculate the portfolio's total time-weighted rate of return in exactly the same manner as used by large institutional accounts. It is immediately available for a 48K-byte Apple with a single disk drive and works with the VisiCalc program. Pear Systems, Stamford, CT.

CIRCLE INQUIRY NO. 157

Word processor for IBM PC

Volkwriter uses the entire IBM keyboard, including 20 function keys. It is alleged to be self-teaching. It's files are written in standard DOS format and the program is written in Pascal. An IBM Personal Computer with 64K memory, one disk drive and IBM DOS is required. For extensive writing, 128K memory is recommended. Lifetree Software, Monterey, CA.

CIRCLE INQUIRY NO. 161

Screen handler/report writer for dBASE II

Zip, which runs on 24-by-80 ASCII and ANSI terminal and 8-bit 48K micro under CP/M, enables the user to customize screen input and output format. It can handle up to 88 lines and provides horizontal and vertical markers, tab spacing, page length and printer margin, which can be dynamically changed while working up a form or screen format. Zip can be used to create invoices, time sheets, inventory listings and other forms, and menus for applications programs. Ashton-Tate, Culver City, CA.

CIRCLE INQUIRY NO. 162

Spelling package for IBM PC

EasySpeller for the IBM personal computer is designed to check the spelling of

documents created by IBM's EasyWriter 1.0 and 1.1 word processing software packages and/or IBM's standard DOS. It includes the complete 88,710 word Proximity lexicon, along with software for spelling error detection, interactive correction and verification, and an operator tutorial facility, all on a 5.25-in. singled-sided, double-density diskette. Proximity Devices Corp., Fort Lauderdale, FL.

CIRCLE INQUIRY NO. 163

Native code compiler for CP/M

Basic/Z requires CP/M rev. #2.x, and a console device with addressable cursor. It is hardware-independent and I/O is supported at the level of source code. Sequential files are supported with read/write capability, allowing extension or truncation without the need to copy the entire file. System/Z, Richton Park, IL.

CIRCLE INQUIRY NO. 164

Cassette-based software

Business application cassettes include VU-Calc, which constructs, generates and calculates large tables for applications such as analysis, budget sheets and projections, and VU-File, for general purpose filing and information retrieval. The programs, for the Sinclair ZX81 system, require the addition of a 16K-AM pack. Sinclair Research, Boston, MA.

CIRCLE INQUIRY NO. 165

Database manager

T.I.M. III, Version 3.2, has been compiled and now runs approximately 20 times faster than the interpretive version running on the IBM Personal Computer. The system operates under MS-DOS including the IBM Personal Computer DOS. Innovative Software, Overland Park, KS.

CIRCLE INQUIRY NO. 166

Client accounting system

Ultra Professional Time Billing System is designed to run on several word processors, as well as most CP/M based microcomputers. The unit provides for operator entry of professional time spent, the description of services, and separate categories for out-of-pocket expenses or disbursements. Hardware requirements are a 24-by-80 character screen, two floppy disk drives of minimum 240K capacity each, 50K user memory, and the CP/M operating system. Professional Software Innovations, Pensacola, FL.

CIRCLE INQUIRY NO. 167

Portfolio management system

Portcom is the fourth module in an integrated portfolio management system for the Apple Computer, operating stand-alone or with other Portware modules. Portcom automatically logs-on to the Dow Jones Service, retrieves and stores quotes, and updates portfolio files. Other modules

announced include Portrate for analysis and planning; Portrac for record-keeping and Portrend for monthly portfolio and market performance measurement. The software operates with a 48K Apple II+, at least one disk drive and an optional printer. Portware, Edina, MN.

CIRCLE INQUIRY NO. 168

Public accounting system

Series 800 Client Write-Up package handles cash disbursements, cash receipts, payroll, post-payroll processing and complete financial reporting including budgets, comparative analyses and reports based on end-user requirements. It also handles recurring journal transactions and automatic posting as part of the month-end closing process. The package generates journals, ledgers, statements and trial balances on demand and it produces state and federal payroll reports as needed. Other packages available in the system are time accounting, which tracks work in progress and productivity; fixed asset amortization, which calculates depreciation and investment tax credit; MicroPlan, for financial planning; Microtax, which automatically processes federal and state tax from one initial data entry; and Star Text, which provides complete word processing. Durango Systems, San Jose, CA.

CIRCLE INQUIRY NO. 169

Mailing list package

Mailtrak consists of three programs and a control file and runs under IBM DOS. The system uses random access data files with as many as 1,200 records on a standard IBM diskette. Data stored for each record includes first and last names, two address lines, city, state, nine-character zip, country code (optional), five mail codes, and four activity codes with dates. TCI Software, Flourtown, PA.

CIRCLE INQUIRY NO. 170

Real estate analysis program

Business Management IV is a complete system for analyzing and performing sensitivity studies on real estate investments. The system can analyze before-tax and after-tax cash flows. It is available on a single 8-in. diskette for the TRS-80 Model II 64K bytes in TRSDOS 2.0A or CP/M. Century Software Systems, Los Angeles, CA.

CIRCLE INQUIRY NO. 171

BUSINESS SYSTEMS

Second generation 16-bit systems

Wicat Series 100 and 150 are 68000-based and include faster memory boards with error correction, removed wait states, hardware floating point, intelligent I/O, and optional Winchester drives. Wicat Systems, Orem, UT.

CIRCLE INQUIRY NO. 172

16-bit systems

X-8000 and X-6000 systems have 256K bytes of RAM, 15-slot backplanes, 40-amp power supply and dual 8-in. floppy disk drives. Options include up to 16M bytes of RAM, Winchester hard disk drives, cartridge disk drives, and a selection of peripherals. X-8000 is based on the Z8001 chip and offers eight serial I/O ports, an operating system that supports from 1 to 32 users simultaneously and as much as 250 million bytes of on-line media storage. The X-6000 system is based on the 68000 chip and handles up to 64K bytes of onboard EPROM and 128K of onboard RAM, has seven prioritized vectored interrupts and one non-maskable interrupt, two RS-232 serial I/O ports with 40 bits of parallel I/O and has a triple 16-bit timer/counter for generating interrupts or monitoring external events. Computex Microcomputer Systems, Chicago, IL.

CIRCLE INQUIRY NO. 173

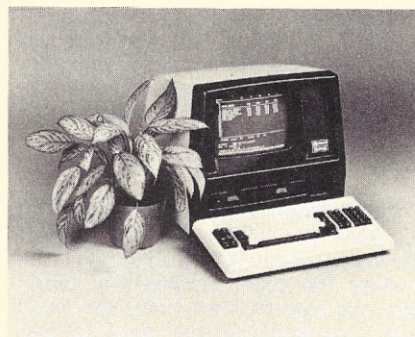
16-bit system and upgrade kit

Advantage 8/16 includes both an 8088 and a Z80 microprocessor. This system can also be created by adding the 8/16 upgrade kit to the existing 8-bit Z80A-based North Star Advantage. The 8/16 supports Graphics CP/M, GDOS/Basic, and the proprietary North Star ASP, plus the 16-bit operating systems—MSDOS (PCDOS). North Star Computers, San Leandro, CA.

CIRCLE INQUIRY NO. 174

Telecommuting console

Topper is a personal automation system designed for use in both the home and office. Designed for 3270 networks, it has a fully compatible IBM 3278 keyboard and a 12-in. high-resolution monitor. It can be used as a stand-alone CP/M-



based computer or used on-line with a BSC/SNA protocol converter, it works like a standard IBM 3278 or a personal RJE station. It also provides an interactive window to the world's timesharing and database networks. Beehive Int'l., Salt Lake City, UT.

CIRCLE INQUIRY NO. 175

Combined 8- and 16-bit technology

Molecular Supermicro 8 and Supermicro 32 systems now have 16-bit capability.

They function under the company's proprietary CP/M-compatible nStar operating system. Capability includes up to 1M byte of RAM in 256K increments, an Intel 8089 I/O direct memory access (DMA) processor, an 8MHz clock, and parity for error detection. Options include an Intel 8087 math processor with floating point, and error correction circuitry. Molecular Computer, San Jose, CA.

CIRCLE INQUIRY NO. 176

Portable computer

M6000P features modular design utilizing an 8-slot card cage, a 9-in. green-phosphor CRT with 80 character by 24 line display and a standard, VT 100 style detachable keyboard. It can use single



and double-sided or density diskettes under CP/M 2.2 and has a rear connector for an optional 8-in. disk. Micro Source, New Lebanon, OH.

CIRCLE INQUIRY NO. 177

Z80A-based portable

Courier includes a 9-in., 80 column display, professional keyboard, 3.5-in. disks, driven by an expandable STD Bus. It measures 17-in. wide, 7-in. high and 13-in. deep, and weighs less than 20 lbs. It incorporates a 9-in. green phosphor CRT and full editing terminal keyboard with 92 keys. Other standard features of the unit



include two fully implemented RS-232C channels, dual port memory, CP/M compatibility and direct memory access (DMA). The CP-50 option provides the user a full sized dot-matrix 50cps impact printer that adds about nine lbs. Jonos Ltd., Anaheim, CA.

CIRCLE INQUIRY NO. 178

16-bit CP/M-based system

TS/1600 series can operate in TeleVideo's 8-bit TS/806 and TS/816 multitasking systems because of their multi-CPU architecture, alongside of 8-bit-based work stations. The computers are configured with an Intel 8088 16-bit chip with a CPU processing speed of 5 MHz and 256K bytes of dynamic RAM. Up to six TS/1600 models can operate in conjunction with a TS/806 and up to 16 can operate with a TS/816. The TS/806 offers 9.6M bytes of (unformatted) storage on a 5.25-in. Winchester hard disk; the TS/816 has 23.5M bytes of hard-disk storage and 17.5M bytes of tape drive backup, both unformatted. TeleVideo Systems, Sunnyvale, CA.

CIRCLE INQUIRY NO. 179

16-bit multiuser systems

Supermicro 8 and Supermicro 32 are based on the 8086 microprocessor with up to 1M byte of memory and will also have Z80A microprocessors functioning under Molecular's proprietary CP/M-compatible n/Star operating system. Molecular's n/Star Network Operating System is compatible with both CP/M-86 (16-bit version of the popular CP/M operating system)

and CP/M, permitting immediate use of CP/M and CP/M-86 application programs. File compatibility between CP/M and CP/M-86 allows sharing of files and eases conversion of applications from 8-bit to 16-bit processors. Molecular Computer, San Jose, CA.

CIRCLE INQUIRY NO. 181

Small business systems

CIES 680 family is offered in three versions: 680/10 for the single-user; 680/20 business



computer for one to four simultaneous users; and 680/40 that can be expanded

to 16-plus simultaneous users. All models utilize M68000 32/16-bit microprocessor technology and employ Multibus architecture. CIE Systems, Irvine, CA.

CIRCLE INQUIRY NO. 180

8/16-bit multiuser desktop computer

Monarch supports CP/M, MP/M II, CP/M-86, MP/M-86, UNIX, Oasis-8, Oasis-16 and Business Basic. Model 6600 standard



configuration unit includes 256K bytes of RAM, 19M bytes of Winchester disk storage, nine RS-232 serial ports, one RS-422 high speed port, one parallel port, and an 8-in. IBM-compatible disk drive. It can support up to 76M bytes of Winchester disk storage

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coupled with a 17M-byte cartridge tape drive. Main memory can expand up to 1M byte of memory in 256K increments, and eight additional serial ports can be added. Dynabyte, Milpitas, CA.

CIRCLE INQUIRY NO. 182

Multiuser business system

RX400 features ready-to-run application software, multiprocessor architecture, up to 280M bytes of Winchester disk storage, up to 960K bytes of memory, and up to 16 serial ports. Six models of the RX400 are

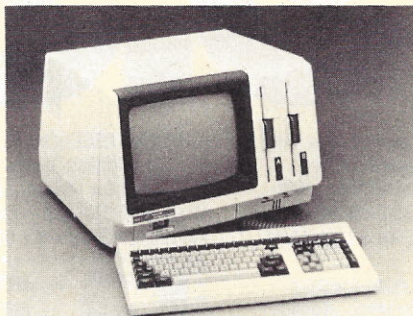


offered. The models differ in the amount of computer memory and disk storage provided and the number of video display terminals and printers accommodated. Rexon, Culver City, CA.

CIRCLE INQUIRY NO. 183

16-bit personal computer

Advanced Personal Computer (APC) utilizes the CP/M-86 operating system. It also features 128K or 256K bytes of user memory, color and monochrome displays, floppy disk storage capacity of up



to 2M bytes; user-definable character set; user-definable function keys; and high-resolution symbol and line drawing graphics. NEC Information Systems, Lexington, MA.

CIRCLE INQUIRY NO. 184

Entry-level workstation

Xerox 820-II includes extensive storage, printing and communications options. The system can communicate on the Ethernet local area communications network. Significant features of the 820-II over the existing Xerox 820 system include a faster

processor, an enhanced CPM operating system that permits higher performance, a 10M-byte fixed disk and a bus access slot for future system expansion. Xerox Corp., Dallas, TX.

CIRCLE INQUIRY NO. 185

Desktop series

Z100 series has as standard features both 8- and 16-bit microprocessors, a five slot S100 expansion chassis, two built-in 320K byte 5.25-in. diskette drives, 128K bytes of



RAM, color graphics with control of eight colors and 144,000 dots, and keyboard in a single housing. Memory is expandable on all models to 768K bytes. Zenith Data Systems, Glenview, IL.

CIRCLE INQUIRY NO. 186

Dedicated word processor

Cado CAT Writer incorporates a full range of document-oriented text handling and formatting features, including column manipulation, file creation and horizontal scrolling. Users may select any of a wide range of compatible word processing printers for use with the system. The basic unit includes the videoscreen/keyboard, the processor with 96K bytes of memory, an 8-in. single-sided diskette with a 630K-byte capacity, complete word processing software and tutorials. Cado Systems Corp., Torrance, CA.

CIRCLE INQUIRY NO. 187

Electronic deskset

Datavox-One is an executive workstation that gives corporate professionals user-



friendly access to voice and data information-handling systems. When operating as a timesharing terminal to access publicly available business information, the

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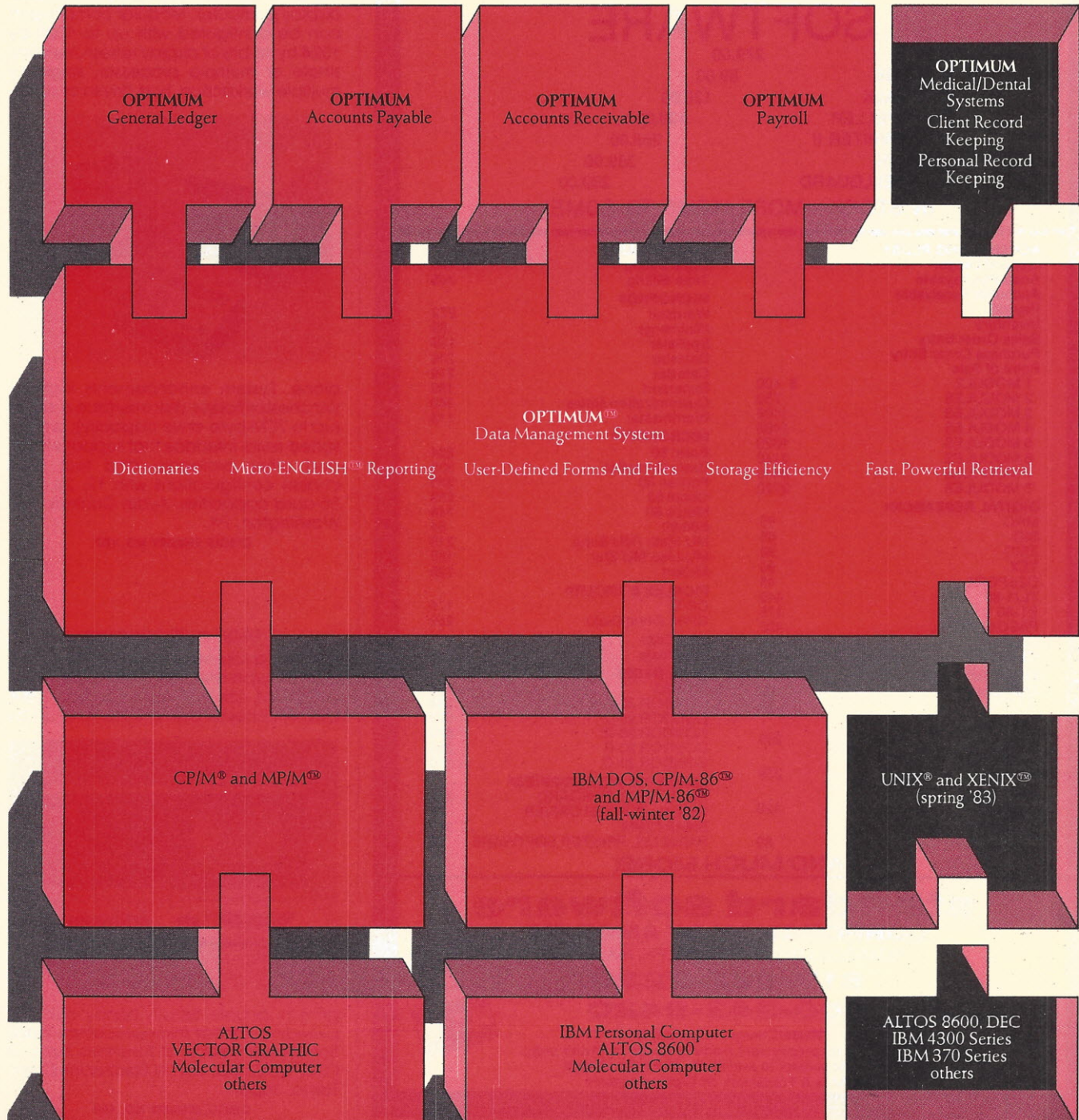
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CIRCLE INQUIRY NO. 188

Display units

Aycon 16/Series offers enhancements and cost reductions over its predecessor, the 5216 high-resolution, color raster-scan display computer. Modular components can be configured with up to 1024 by 1024 by 16 bits of display refresh memory, single or multiple processor, single or multiple workstation, host driven or stand-

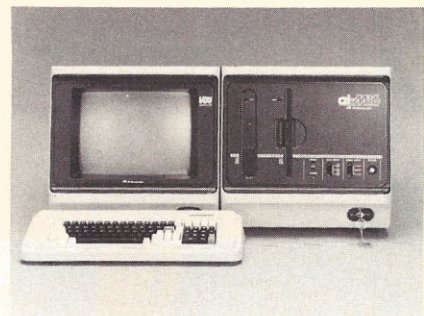


alone. System enhancements include: Winchester/floppy disk interface module (up to 70M-byte drive capacity); a high-speed serial interface that supports HDLC and other protocols; and four OEM chassis configurations with 12, 24, and 36-card capacities. Aydin Controls, Fort Washington, PA.

CIRCLE INQUIRY NO. 189

16-bit multiprocessor

Ai-M16 is a fully-equipped 16-bit machine that incorporates an 8086 CPU, 512K bytes RAM, 16K ROM, and a 5.25-in. 7.8M-byte Winchester disk unit backed up by



an 8-in. double density floppy disk unit, providing various microprocessors additionally with each of functions such as FDC, WDC, SIO, etc. Ai Electronics Corp., Tokyo, Japan.

CIRCLE INQUIRY NO. 190

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DATA COMMUNICATIONS

Videotex for IBM

IBM Series/1 Videotex System (SVS/1) is a licensed program that enables organizations to send and receive text and graphics. The system can be used to transmit internal mail, budgets, sales and merchandising information, travel schedules, and bulletin board notices. It uses standard telephone lines to link micros and television monitors equipped with special adapters, or appropriate low-cost



videotex terminals, to data contained in an IBM Series/1 general purpose computer. The system can respond to up to 24 concurrent videotex callers, and can support a larger number of intermittent callers. IBM, Town of Rye, NY.

CIRCLE INQUIRY NO. 191

Direct connect modem

DC-1200 High Speed Modem operates at either 0-300 or 1200 baud. Both full- and half-duplex operation are supported at both speeds. The unit features manual originate (plus auto-dialer option available), automatic answer operation, and is self-adjusting to the incoming baud rate. A self-test mode has also been incorporated. Connection to telephone circuits is made via a standard modular connector; linking to single lines is direct. Tandy Corp., Fort Worth, TX.

CIRCLE INQUIRY NO. 192

File transfer for IBM PC

Move-It, for both PC-DOS and CPM/86, allows the user to transfer files to and from another Personal Computer, as well as transfer files to and from any other computer running CP/M, MP/M, CP/M-86, and MP/M-86. This can be accomplished even if the two computers use different disk formats. Woolf Software Systems, Canoga Park, CA.

CIRCLE INQUIRY NO. 193

Telecommunications for Vic-20

Vicmodem cartridge allows transmission of computer signals over telephone lines—and a modular telephone. Also included is Victerm I software, which programs the Vic-20 for telecommuni-

cating. Commodore Business Machines, Wayne, PA.

CIRCLE INQUIRY NO. 194

Software encryption

Kryptyk allows users of any CP/M or MP/M based workstation computer to achieve program and data security without hardware modification. Using unique two-layer security, the program incorporates both a public encryption key and a password-protected decryption key. Kryptyk is designed for transmission of proprietary information and has two layers of security and only the receiver of the material can decode the information. Kryptyk users can generate a secure encryption key from 12 to 300 digits, two-thirds of which is accessed publicly. The remaining digits are retained by the transmitting user. It is possible to generate as many sets of security keys as a sender desires, specifying the length from 40 to 1,000 bits. Each key-bit doubles the security of the data. By specifying the correspondent identification code, users of Kryptyk can encrypt a data file to send to an output site through electronic transmission. Epic Computer Products, Fountain Valley, CA.

CIRCLE INQUIRY NO. 195

RS-232C modem

Micro Link 1200 is Bell 212-compatible and operates at 1200 baud in full duplex over standard phone lines. Connection to the phone lines is via an RJ11C standard phone jack. It provides Manual Originate/Manual Answer operation. An



analog loopback, self-test feature is included. There are five front-panel LED indicators for Power On, Carrier Detect, Self Test, Send Data, and Receive Data. U.S. Robotics, Chicago, IL.

CIRCLE INQUIRY NO. 197

Telecommunications interface

Chat II can interconnect any standard word processor or personal computer with the three major domestic and international business communications networks, Telex, TWX and Bell System DDD. It can also create more than 20 office network configurations with dissimilar equipment by adding a series of options. It includes expandable memory and a



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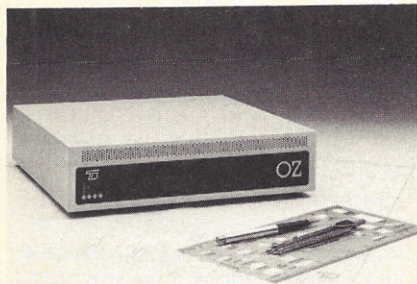
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printer port. Included is 16K static RAM memory with battery backup. Chat Communications, Mountain View, CA.

CIRCLE INQUIRY NO. 199

Intelligent network modem

OZ 225 is an asynchronous 212-compatible modem designed to maximize the efficiency of data flow in large computer networks. It operates as both an originate and answer modem at speeds



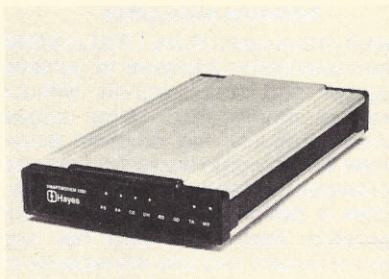
of 110, 300, or 1200 baud. It can be installed with virtually any asynchronous, ASCII terminal that provides an RS-232 connection as well as to a host computer or a network processor. Tri-Data, Mountain View, CA.

CIRCLE INQUIRY NO. 198

RS-232C-compatible modem

Smartmodem 1200 is a Bell 212A-compatible unit that lets RS-232C-compatible computers or terminals communicate over telephone lines at 1200 bps. The device also connects directly to the telephone line and an RS-232C port. It is approved by the FCC

for direct connection to any U.S. telephone system for both pulse and Touch-Tone dialing. Both types of dialing may



be combined in a single command with pulse used, for example, to access a PBX board and Touch-Tone used to dial an outside number. It operates at either 0-300 bps or 1200 bps. It is an intelligent system that executes user commands and responds with either decimal digit or English word result codes. Hayes Microcomputer Products, Norcross, GA.

CIRCLE INQUIRY NO. 200

GRAPHICS

Hi-res for Fortune

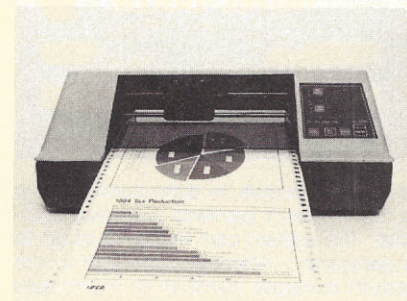
Capable of being fully integrated with other software components, the Fortune 32:16 system enables one to combine graphics, word processing, financial modeling and accounting software in the production of the same document. Two video controllers are offered for the system. The standard combines bit-map graphics display control with 64K bytes of memory providing pixel densities of either

640-by-480 or 800-by-480 on a monochromatic screen. The optional unit comes with 256K bytes of memory and a dedicated graphics microprocessor. In the color mode, the user can select up to 16 colors. Fortune Systems, San Carlos, CA.

CIRCLE INQUIRY NO. 201

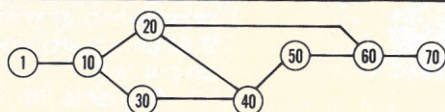
Eight-pen plotter

Zeta 8 plots at a speed of 20 ips with 2-g acceleration. Effective for business or scientific applications, it features a new character set similar to the group of Helvetica-based type faces used in typesetting. The plotter offers .001-in. resolution. Media includes translucent paper, vellum, glossy bond, and clear acetate for view graph presentations. Pens can be nylon tip or liquid roller and



are capped when not in use to prevent drying out. Both local and remote interface via RS-232 and IEEE-488, at eight data rates from 110 to 9600 baud asynchronous, are user-selectable. Communication line error detection and correction via automatic retransmission are provided. Dimensions are 24 by 12 by

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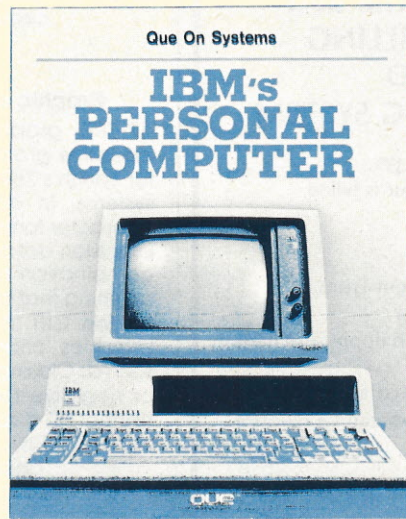
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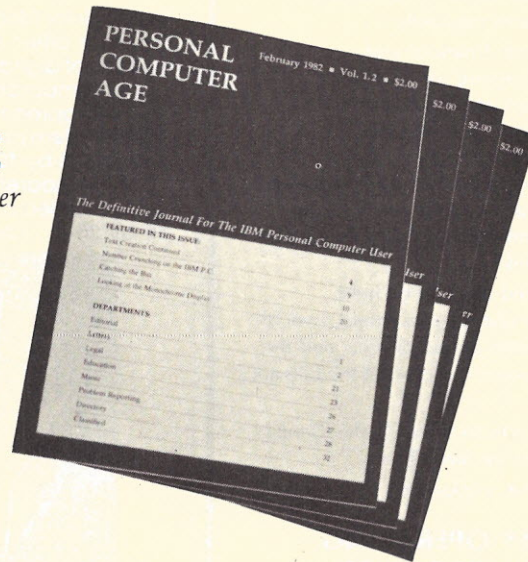
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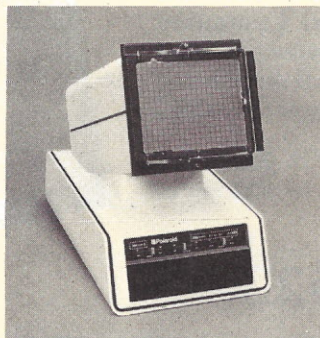
Graphic extensions for Zenith

AP-PAK graphics package provides extensive graphics printing capabilities for Zenith's Z89 and Z90 microcomputer systems. In addition to a number of character fonts, variable type sizes, and precision dot-addressable graphics, the combination makes it possible to print anything that can be stored or displayed on the CRT. It allows the definition of graphics characters (including letters such as Old English and Hebrew in positive or negative form) to be printed, which cannot be displayed. Micro Peripherals, Salt Lake City, UT.

CIRCLE INQUIRY NO. 203

Video color film recorder

VideoPrinter Model 8, 8-by-10 instant film recorder offers the photographic capabilities of digital image processing at a price comparable to analog devices. The microprocessor-controlled display-driven system produces continuous-tone Polaroid 8-by-10-in. instant color overhead transparencies and prints of computer or video images. Measuring 24 by 16 by 25 in., and weighing 50 lbs., the



system digitizes the video signal and matches contrast, density and other exposure parameters to the film type used. It determines 256 tonal scale levels for each color and relates them to the particular film's characteristics. It calculates gray-scale transfer functions, permitting exposure control. Polaroid, Cambridge, MA.

CIRCLE INQUIRY NO. 204

Graphics language for Apple

GraForth is loosely related to Forth in structure, but it supports standard DOS text files, so data can be shared with other languages and programs. Features include: 3-D color graphics, character graphics, turtle graphics, line and plotting graphics and a music synthesizer. Insoft, Portland, OR.

CIRCLE INQUIRY NO. 205

Intelligent processor

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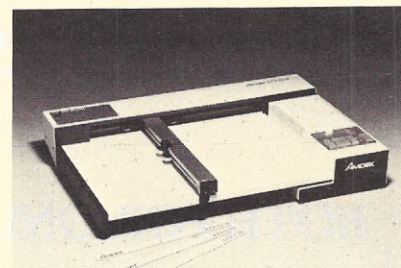


with the power of microprocessor technology to enable the Printronix printers to perform functions ranging from forms generation, bar codes, line/box segment graphics, reverse image printing and character rotation to stored logo graphics, large block characters, compressed print fonts and forms overlays. The graphic processor's user-friendly simplicity allows for the rapid and inexpensive development of high-power output applications such as forms generation, label production and data emphasis. Printronix, Irvine, CA.

CIRCLE INQUIRY NO. 206

Four-color plotter

Model DXY is designed for use with small computers. It has a 10-in. by 14-in. effective plotting range. Figures may be drawn using



the Control or Basic commands. Functions may be expanded by adding additional ROM. Amdek Corp., Arlington Heights, IL.

CIRCLE INQUIRY NO. 207

Hi-res monitor

Color IV features 720 (H) by 420 (V) line resolution, 80-by-24 character display capability with analog R.G.B. input compatibility for 4096 computer-controlled color variations. It is compatible with Apple III, 5100 graphic board and new DEC VT-125 terminal. The unit incorporates an in-line, high resolution 13-in. CRT plus a high performance deflection yoke and transformerless power supply for an unusually bright picture with low distortion. Amdek Corp., Arlington Heights, IL.

CIRCLE INQUIRY NO. 208

MEMORY/CPU

128K memory for Atari

Ramdisk comes with software that makes the new system function like a disk device. It can also be programmed as bank selectable RAM memory. The system is organized into eight 16K pages, which

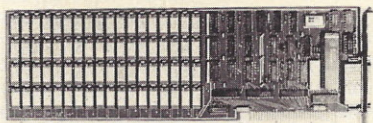


can be selected under program control. It is installed in the second RAM slot in the 800 with 16K RAM modules in the first and third RAM slots providing 160K bytes of RAM memory. Axlon, Inc., Sunnyvale, CA.

CIRCLE INQUIRY NO. 209

Increased memory for IBM PC

CI-PCM+ requires one I/O expansion slot for 512K bytes of memory with parity, plus an RS232-C port. The addition of the RS232-C port essentially frees one I/O expansion slot allowing the user to add 512K bytes



of memory to the personal computer requiring no extra slot. It is addressable in 64K byte increments throughout the one mega byte address field. Chrislin Industries, Westlake Village, CA.

CIRCLE INQUIRY NO. 210

High capacity disk

MD2-HD is produced by using epitaxial magnetic material produced from Gamma Hematite with cobalt ferrite. It uses the same recording format as the 8-in. floppy disk and is interchangeable with the larger size disk in terms of software. It can also use an 8-in. floppy controller. This 5.25-in. disk is said to match the memory capacity of an 8-in. double-sided, double-density floppy. Maxell Corp. of America, Computer Products Div., Moonachie, NJ.

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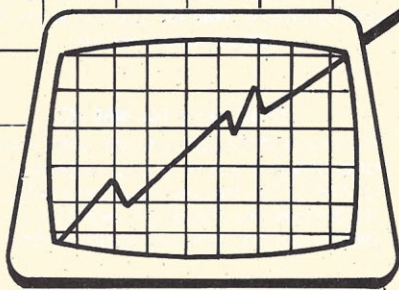
Combination board for IBM PC

Quadboard leaves slots free for further expansion. It is totally compatible with IBM hardware, and includes 256K memory expansion, clock/calendar, parallel printer I/O, and asynchronous (RS232) communications adapter. Memory expansion is socketed and expandable in 64K increments to 256K. Full parity generation and

checking is standard. A Quadboard exclusive feature allows parity to be switch disabled to avoid system lock-up upon error detection. The dip switches also allow it to be addressed starting on any 64K block so that it takes up only as much address as it has memory installed. Quadram Corp., Norcross, GA.

CIRCLE INQUIRY NO. 214

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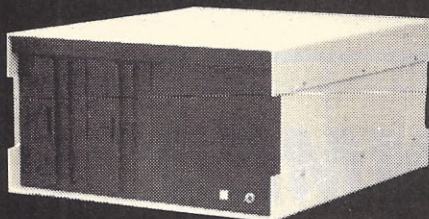
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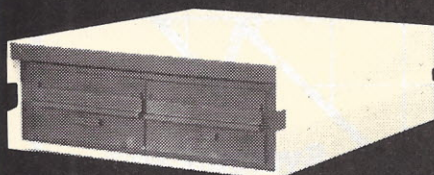
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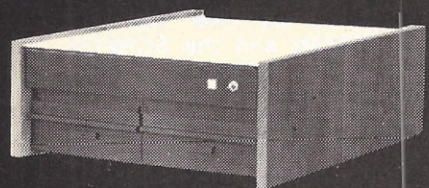
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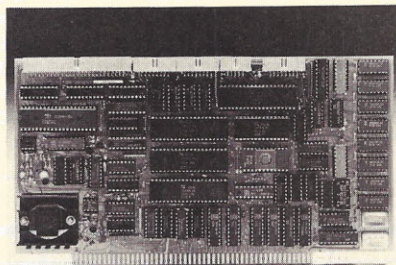
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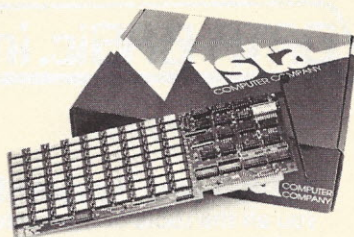


controller board, and an I/O board along with DMA capabilities and advanced BIOS. Based around the Z80A family and the NEC 765AC controller chip, this new product requires no bus to operate. But plugged into an S-100 bus, it can be used as a stand-alone, single- or two-user system, or as the master CPU in a multi-user or multi-processing system. The BIOS includes automatic density and single- or double-sided operation. The BIOS will support 5.25-in. and 8-in. drives simultaneously. Single-user, multi-user, and multi-processing software are available. Teletex, Sacramento, CA.

CIRCLE INQUIRY NO. 211

576K card for IBM PC

Full capacity Maxicard uses only one slot, and allows the user to populate any and all 64K blocks between 64K and 640K. The addresses are dipswitch selectable and blocks are not required to be continuous.



The board uses industry standard 64K-byte dynamic RAM's, runs at full speed with no wait states and contains on board parity bit on each byte. Vista Computer Company, Santa Ana, CA.

CIRCLE INQUIRY NO. 212

Mass storage subsystem

UP-9705 Universal Winchester unit provides the advantages of hard disk data storage for a wide variety of microcomputers. Through use of interchangeable Host Adapter Personality Cards, the subsystem can be adapted quickly for compatibility with a large selection of microcomputers—

including Apple and IBM systems. United Peripherals, Sunnyvale, CA.

CIRCLE INQUIRY NO. 215

MISCELLANEOUS

Data monitor

801A Mini Fox permits online monitoring when plugged into an RS-232C interface. It automatically determines line configuration and displays real-time, full-duplex data. It handles most standard protocols and codes. It can be equipped for testing bit error rates. It measures 14.75 by 14.75 by 5.5 in. and weighs 17 lbs. Halcyon, San Jose, CA.

CIRCLE INQUIRY NO. 216

Apple cases

Apple Crate cases are constructed from a lightweight, water proof material called Cordura, used in the design of mountaineering and back-packing equipment. A 3/8-in. closed cell foam provides the cases with shock and vibration protection. The cases are compactly constructed to fit under airline seats and each comes with an adapter to allow you to connect the computer to any hotel/motel TV. The disk drive case can be carried attached to the computer case or separately. Abcom Corp., Van Nuys, CA.

CIRCLE INQUIRY NO. 217

Storage medium controller

Gypsy is a high performance disk/tape controller. It can backup 20M bytes of disk data in less than four minutes, and allows any host to interface with a Priam Winchester drive. It supports all major .25-in. tape drives and communicates with the host via a simple parallel I/O port or through one of the company's host interface adapter boards. Other features include CRC error detection; offline backup and restore functions; the ability to control up to four 8-in. and 14-in. disk drives as well as four tape units; and multiple sector access capability. Adaptive Data & Energy Systems, Pomona, CA 91768.

CIRCLE INQUIRY NO. 218

TRS-80 color graphic printer

26-1192 four-color printer with plotting capability can create four-color pie charts, as well as other text and graphics. 96 ASCII characters are available in four colors (red, blue, green, black). The graphics mode offers a selection of 16 character widths from 5 to 80 characters per line. The text mode offers 80- and 40-character-per-line text printing at 12 characters-per-second. Both parallel and serial interfaces are built-in. Commands include backspace, reverse line feed, change colors, change line type (solid or 15 types of dashed lines), change print direction (normal left-to-right, top-to-bottom, upside down or bottom-to-top), move



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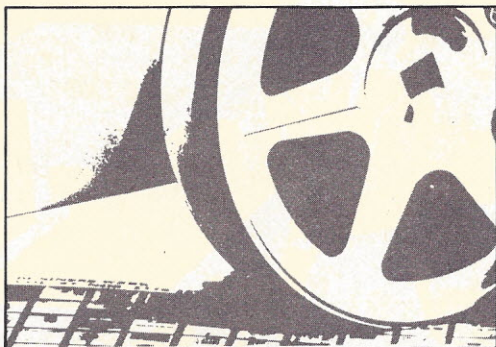
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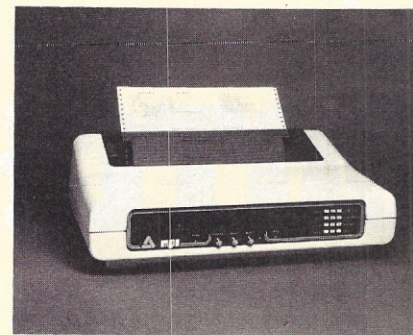


with RS-232-equipped TRS-80 Model I/III computers, Color Computers, Model II and Model 16 computers and PT-210 RS-232 Portable Data Terminals. Tandy Corp., Fort Worth, TX.

CIRCLE INQUIRY NO. 219

Wide carriage printer

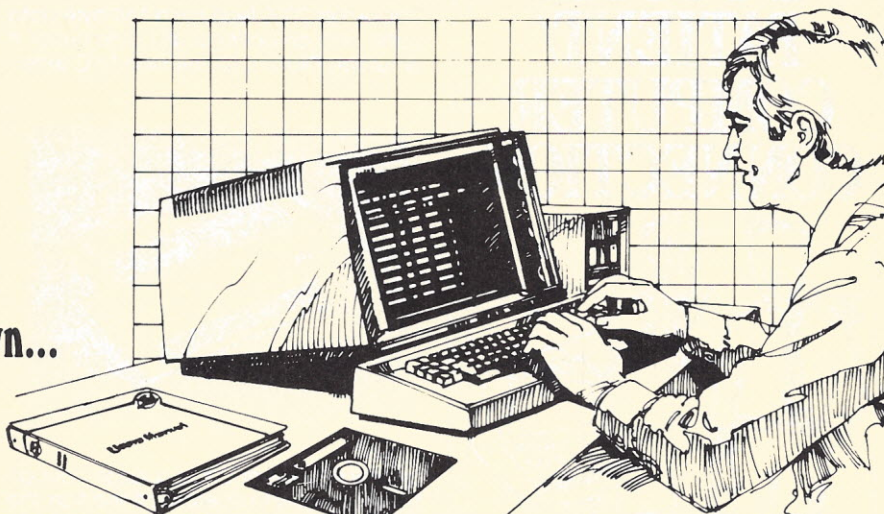
Model MP150 matrix printer forms characters bidirectionally in a logic-seeking mode to optimize system throughput. Nine ballistically driven print wires form crisp, clear characters with true descenders and underlining capability. It can print a full 136-character line at 10 characters per inch or, by selecting either the 12 or 17 character-per-inch density, up to 226 columns may be printed. This allows full 136-column printouts to be condensed to fit on standard 8.5-in. wide



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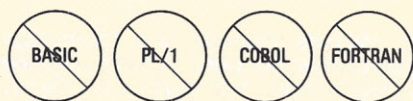
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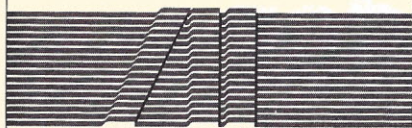
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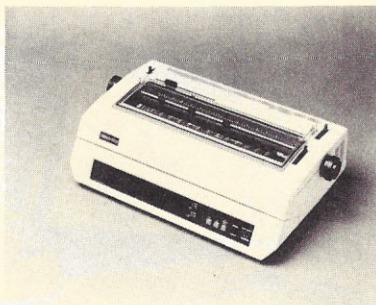
PAS-3 requires MP/M or CP/M operating system, 56K memory and 132-col. printer. TM Digital Research.

plotting, printing of screen graphics, drawing of illustrations, and producing special characters or identification marks. MPI, Salt Lake City, UT.

CIRCLE INQUIRY NO. 220

Daisywheel printer

Daisywriter 2000 features a 16K-byte data buffer with an optional 48K-byte buffer. It emulates Diablo, Qume and NEC letter-

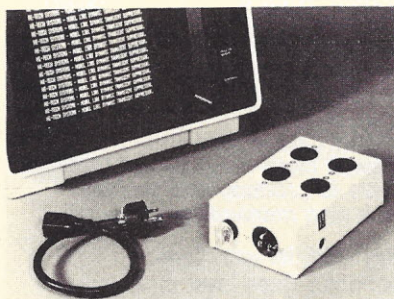


quality printers and has a large enough buffer memory to operate off-line from the host computer for an hour. Computers International, Los Angeles, CA.

CIRCLE INQUIRY NO. 221

Dynamic transient suppressor

Model HT-1301-PI plug-in suppression system provides auto-ranging clamping with indicator at 20% above the line voltage waveform. The system's fast response time of 5 nS makes it ideally suited for sensitive applications, such as MOS or TTL circuitry.



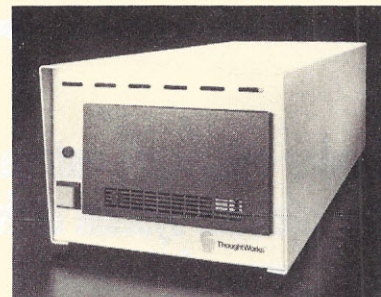
high speed OP amps and comparators, measuring systems with high impedance transducers, motor/generator insulation protection, all types of computers or microprocessor-controlled devices. Hi-Tech Systems, Lebanon, IN.

CIRCLE INQUIRY NO. 235

Data storage extender

HDO5-XE005 intelligent hard disk subsystem is designed specifically to increase the data storage capability of the Xerox 820 Information Processor. The unit expands the storage capability of the Xerox system from 241K bytes to 5M bytes.

The product is also available in 10 and 16M-byte capacities. Any combination of the unit can be mixed or matched to



provide up to 64M bytes of data storage capability. ThoughtWorks, Phoenix, AZ.

CIRCLE INQUIRY NO. 236

Intelligent printer interface

SooperSpooler is designed to free microcomputers from the mundane task of printing. In addition to being a hardware buffer, many software-selectable formatting features are accessible with a simple Basic program. The base model includes



a 16K-byte memory and Centronics-compatible I/O ports. A self-contained power supply, two digit L.E.D. display showing the amount of data stored in the buffer, and a rugged brushed aluminum cabinet also are standard features. Compulink Corp., Longmont, CO.

CIRCLE INQUIRY NO. 237

Vic-20 expansion chassis

Arfon Micro chassis enhances the Vic-20 system by fully expanding the memory, plugging in interfaces for data retrieval, and controlling applications; other computer peripherals; cartridges for expanded Basic language functions; and programming utilities. The unit supports the following features: seven expansion slots; all-aluminum construction; large power supply with toroidal transformer; 5V supply direct to the Vic-20 for cooler operation; 24V supply for the Arfon Micro Vic printer; detachable cover protects cartridges; houses Vic and expansion in one portable unit; holder for RF modulator; supports all Vic-20 cartridges from Arfon Micro, Commodore

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CIRCLE INQUIRY NO. 222

Winchester disk/cartridge

Cyberdrive for the IBM Personal Computer offers either 13.5 or 27 million bytes of disk capacity in a compact single cabinet with an integrated mini-cartridge tape for secure data backup. It is based on multiple microprocessor-controlled operation, weighs 20-lbs, and measures 7-by-15 by 14-in. Cybernetics, Huntington Beach, CA.

CIRCLE INQUIRY NO. 223

Winchester subsystem

The UP-9705 subsystem can be adapted through use of interchangeable Host Adapter Personality Cards for compatibility with a large selection of microcomputers. It provides 5M bytes of on-line mass storage, the equivalent capacity contained in four double-sided, double-density 8-in. floppy disks. Measuring 4.75 by 6.5 by 14.12-in. and weighing 16-lbs., it combines Xebec's S1410 single-board, microprocessor-based controller with 5.25-in. Winchester disk drive. The subsystem has an average access time



of 170mS and will operate from either 115V or 230V AC power. It features the SASI interface. United Peripherals, Sunnyvale, CA.

CIRCLE INQUIRY NO. 224

Magnetic tape subsystem

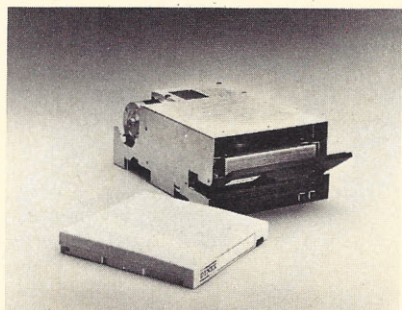
IDT's model SCDR-1050 tape drive features IBM, ANSI and ECMA-compatible hardware

and software for Apple computers. Apple users can communicate with most IBM-compatible large mainframes utilizing nine-track (NRZ 800 cpi and/or 1600 cpi PE) magnetic tape. A typical 2,400 ft., 10.50-in. tape reel will accommodate over 40M bytes of formatted data for any application, including back-up. Innovative Data Technology, San Diego, CA.

CIRCLE INQUIRY NO. 225

Winchester disk drive

The WD505 model provides high-performance upgrade to existing floppy



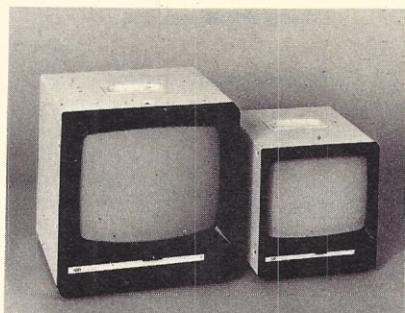
systems. It meets the ANSI packaging requirements providing the same dimensions as a standard 5.25-in. fixed disk Winchester. The unit is 3.25-in. high and 5.75-in. wide. The depth of the device is 8-in. Dynex, Phoenix, AZ.

CIRCLE INQUIRY NO. 226

TERMINALS

Hi-res screen monitors

Pi series 9 and 12-in. monitors feature a resolution of 1,000 lines at center. The Pi-1 unit has a minimum 64-character by 16-line text display (80 characters by 24 lines



in some applications), while the Pi-2 model has an 80 character by 24-line text display. The Pi-1 model measures 8-5/8 by 8-7/8 by 9-7/8 in. and weighs 15 lbs., while Pi-2 measures 12 by 11-7/8 by 12 in. and weighs 24 lbs. Connection to both is via a standard SO-239 connector or an RCA phone jack. Bandwidth is 20 MHz and

horizontal rate is 15.6 KHz. VSI Int'l., Brisbane, CA.

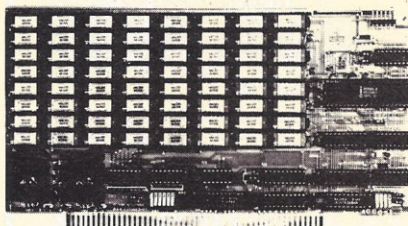
CIRCLE INQUIRY NO. 228

Personal communication terminal

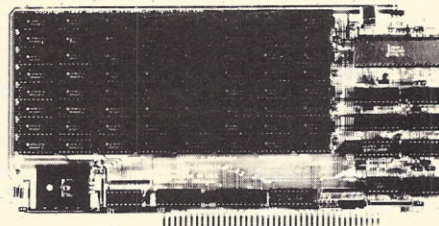
Hotline can be used to transmit and retrieve information from databases. It measures 1-5/8 by 3-9/16 by 6-3/4-in. and weighs less than 11 ounces. The terminal

combines state-of-the-art features such as a built-in modem with more familiar features including an alphanumeric keyboard. The tactile keyboard consists of 43 functional keys arranged in type-writer sequence and provides a 64 upper case ASCII character set. The display is a 16-character fluorescent display, which is tilted for easy viewing. The terminal offers a 220-character receive memory,

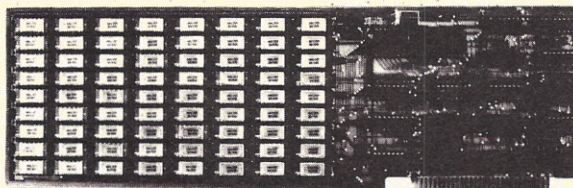
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S-100



TRS 80 Model 2



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which can be scrolled for later viewing, and a 16-character display memory in the transmit mode. In addition to the direct connect built-in modem, an optional acoustic/inductive coupler is available for use with payphones and all other non-modular telephones. Axlon, Sunnyvale, CA.

CIRCLE INQUIRY NO. 227

Portable data terminal

PT-210 portable data terminal includes a full ASCII keyboard, thermal printer and a 110/300 baud (Bell 103A-compatible)



acoustic telephone coupler—in a portable package. Printing is on 100-foot rolls of 8-1/2-in. wide thermal paper. Tandy Corp., Fort Worth, TX.

CIRCLE INQUIRY NO. 229

Touch-sensitive CRT

CRT screen allows immediate and easy access to a computer memory, supplementing or even supplanting the conventional terminal keyboard. It gives 256 switch positions on the CRT screen, compared to 82 or so with a conventional keyboard. And any or all the switch positions can be displayed on the CRT screen without recourse to a shifting apparatus. Screens come in 12/15/17/19-in. (diagonal) sizes and can be bonded or clamped to the CRT or the surround mask. Defector Electronics, Minneapolis, MN.

CIRCLE INQUIRY NO. 230

Ergonomic terminals

The Monochrome 5291 Model 1 Display Station and the 5292 Color Display Station can be integrated into existing IBM 5250 networks. Each displays up to 1,920 characters in a 24-row by 80-character format. Both terminals offer, as standard features, a low-profile typewriter-style keyboard with adjustable slope, tiltable display screen, operator-adjustable audible alarm, and cable-thru, which permits the connection of multiple terminals to a single twinax cable. The Model 1 also has a glare reduction filter for the display screen. It will attach to all models of the IBM System/34, System/38, and Series/1 computers. The 5292 will attach to the System/34 and System/38. It uses a color cathode ray tube to display the following colors: red, green, turquoise, yellow, pink, blue, and

white. The screen has been treated to reduce glare. IBM, Town of Rye, NY.

CIRCLE INQUIRY NO. 231

Smart terminal

The Freedom 100 features a 12-in. green phosphor display with 24-by-80 data display and a 25th status line, 7-by-9 dot matrix characters with descenders, 128 ASCII characters, 15 graphics characters, five-position tilt screen, block transfer



mode, RS-232C or 20 mA current loop interface, data rates from 110 to 19,200 baud, eight edit keys, ten separate function keys, six functional command keys, numeric keypad, and detachable keyboard. Liberty U.S.A., San Francisco, CA.

CIRCLE INQUIRY NO. 232

Hi-res graphics display

Portable 13-in. Color III professional monitor provides high-plus resolution graphics display for Apple III and Apple II personal and business computers. 260 (H) x 300 (V) line resolution and 80-by-24 character display capability plus sharp color separation are major display features. The case measures 16-7/8-in. W by 14-1/2-in. H by



15-in. D. A molded-in carrying handle lets the user move the 32 pound Color III easily. On-Off-volume contrast, brightness contrast, and vertical hold are the only controls needed to use the Color III efficiently. The display colors are red, green, blue, yellow, cyan, magenta and white. Amdek Corp., Arlington Heights, IL.

CIRCLE INQUIRY NO. 234

Communications terminal

Whisper Writer Model B incorporates several features not available in an earlier

model: polling a lot of the computer or another Whisper Writer terminal to call an unattended machine and have whatever is in its memory sent to the inquiry unit. The user simply presses a combination of keys to "arm" the polled unit after message entry. 4K characters can be entered in memory. Control characters appear on the printer with three dots over the letter or number. With split memory, the unit can

retain one document while the other is erased. One efficient use of the split memory feature is entry of log-on to a computer or computer based mail box in the control memory. This accomplishes a single keystroke log-on. Control memory also can be used for preparing a second document separate from those in the regular memory. 3M, St. Paul, MN.

CIRCLE INQUIRY NO. 233

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IA 9/82

Executive Planning with Basic

by X. T. Bui

Sybex, Berkeley, CA

Reviewed by John Edwards

This is a reference for the executive seeking something more. In this case, *more* means traveling beyond pre-packaged programs into the world of serious business planning.

Using a microcomputer as an aid to effective decision-making actually requires two machines: the one on the desktop and that organic one planted inside the cranium. Because planning requires human analysis of the raw data generated by machines, information on this topic is comparatively scarce.

While written on a moderately technical level, the language and concepts involved are nothing beyond the capabilities of any regular reader of this magazine. Some of the areas covered include decision and investment modeling, inventory management, forecasting and portfolio analysis—topics every computerized decision-maker should be familiar with.

This is no cut-and-dry theory book; it's also a library of over a dozen valuable programs relating to all areas of company planning. While the programs were designed to run on an Apple II, the syntax has been kept simple enough to allow for easy transfer to any other Basic-speaking computer. An appendix includes a number of handy subroutines and a complete summary of Basic terms.

197 pages \$12.95

The Software Development Project

by Phillip Bruce and Sam M. Pederson

John Wiley, New York, NY

Reviewed by Rocky Smolin

The production of hardware, once design has been tested, involves quality control to ensure that each item produced is identical in quality and function to every other. Repetition with high efficiency is the key to profitability. There is, however, no corresponding related to most software production. Each effort is a unique project. Once the final bugs are worked out, the job is finished. The disciplines and methods of project management in software development can easily spell the difference between profits and losses.

Based on over thirty years of experience in custom software development, the authors have compiled a definitive—if somewhat dry—manual to guide software developers to the successful completion of their projects. Beginning with an overview of the development process, methodologies for project planning are described. A considerable portion of the book is devoted to cost consideration. The remainder of the book is primarily devoted to management checklists and documentation guidelines.

The techniques and disciplines described are suitable to programs of a few hundred lines of code—the kind normally associated with small business systems. They are also applicable to large software development projects, including command and control systems, spacecraft microprocessor software, commercial data management and accounting systems.

Though not the type of book one is compelled to take home in the evening, it is a comprehensive reference

for most development problems and belongs on the desk of every serious software developer.

210 pages \$22.50

Microcomputer Math

by William Barden Jr.

Howard W. Sams, Co. Inc.

Indianapolis, IN

Reviewed by John C. Nash

This short book presents a competent exposition of some aspects of computer arithmetic. The focus is on binary arithmetic in short word lengths, so the material applies well to microcomputers. The author's style involves a number of fanciful anecdotes set in a fast-food restaurant in Silicon Valley. This may annoy readers who prefer a straightforward approach, but the book is readable and well-designed.

This work might be better titled *Some aspects of Microcomputer arithmetic and logic*. No doubt this would be less marketable, but considerably more helpful to the reader shopping via mail-order. The topics presented are covered well, including binary representation; octal, hexadecimal and other bases; signed numbers and twos-complement notation; carries, overflow and flags; logical operations and shifting; multiplication and division; multiple precision; fractions and scaling; ASCII conventions; and floating point numbers.

A topic not included is binary-coded decimal representation. The coverage of floating point numbers is also somewhat limited. It is probably not sufficient, for example, to allow a good understanding of the IEEE floating point standards now being prepared. Nevertheless, this book offers a useful source of enlightenment for those who wish to know more about the inner workings of their machines.

128 pages \$11.95

Word Processors and Information Processing

by Dan Poynter

Para publishing, Santa Barbara, CA

Reviewed by James C. Graves, Jr.

After deciding to automate the office, the small businessman is faced with the chore of selecting the correct machine. An obvious factor of confusion is injected into the process by the sheer number of word processors available and the many features offered. This book addresses that dilemma and provides a planning guide, an instructional aid and a directory of word processors.

It begins by identifying basic word processor concepts, then discusses areas where business productivity will increase.

One chapter discusses the individual components and peripherals that comprise the word processor. Software options such as spell correction, database, and specialized operating systems receive brief attention.

Obviously, word processors usually require a substantial initial investment. Often this is only part of the total cost incurred. The author illuminates overlooked cost considerations such as electricity, maintenance and training. He offers helpful hints for evaluating and making cost comparisons. Doing a requirement study, setting up a working demonstration and seeking a consultant's advice are suggested. The appendix consists of a resource section and glossary of word processing terms.

170 pages \$11.95

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EASY INSTALLATION. The Microfazer is in a small case (3.5" x 7" x 1"). It is engineered to be plugged directly into the input port of the Epson and other similar printers. Installation can be completed in less than 60 seconds. How's that for not wasting time! Most other centronics compatible printers can be attached by using an adapter cable.

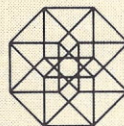
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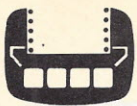
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Word Processing

Continued from page 24

Datapro's report offers a Directory of Automated Office Consultants. Those who have training associates are specified. Training programs are also starting to be offered more routinely by some vendors; inquire about these. Request the names of other purchasers of the same equipment. Ask them about the quality of the training service. For additional listings, refer to the telephone classified pages under data processing and computers. Another possible source for references and exchange of ideas is through a computer society or users' group. Also consult advertisements in computer magazines, newspapers and newsletters.

In regards to the third training option, classes in any specific system may be available from the vendor, through colleges, or from a growing number of specialized schools. The quality of the school, teacher and the number of terminals must be assessed. Classes that do not have a terminal per person for immediate hands-on are generally a waste of time and money.

An entire system may be covered in one or two days or in four to six sessions over an extended period of time. Although personnel will be out of the office, the trainee has nothing else on his mind. In a class situation, each person is shown all the essentials. They inevitably learn from one another as well as from the teacher.

However, giving people too much in one session can be overwhelming and more than they can absorb at one time. However, if exposed to the manuals and other commands, subconsciously they will be aware that what they don't need now can apply later. Subsequent sessions are recommended to develop more sophisticated procedures.

The existence of vendor-sponsored training centers might be a consideration before purchasing a system.

Establish Job Descriptions

It's wise to establish job descriptions before installing a computer system. If correspondence consists primarily of repeat form letters with only minimal changes, for example, you may not need a program with the ultimate in capabilities. Compare available programs by charting their features against one another. Watch the current magazines for program comparisons. These are almost impossible to do by yourself.

After you and the trainer have established the job description, decide how much will be taught and ascertain the trainee's ability to assimilate it all.

When plagued by personnel problems, temporary help might be a solution. As the demand for trained help grows, some of the leading temporary employment agencies are starting their own classes. They know that employers, faced with sick-leave, turnover and peak-load understaffing, appreciate qualified fill-ins—quickly. A temporary employee, familiar with your system, may be used to train new personnel also.

Perhaps the ultimate question is: How well does an employee interface with the system? Katherine Aschner, in *The Word Processing Handbook* (Knowledge Industry Publications, White Plains, NY) notes that if any of the following situations occur, they are warning signs that may require a re-evaluation of how efficiently word processing works in your office:

Slow turn-around time: Four hours is a good standard for letters and short documents. Longer spells trouble. Chronic complaints from users should not be allowed to develop.

Users by-pass: Any time users go out of their way to avoid using the system, a problem exists.

Low morale/high turnover: Low pay may be an answer. Or perhaps too many restrictions and too much isolation of the worker. Evaluate the working conditions.

Poor control; retrieval problems: When the word processing staff cannot find previously-recorded materials, or uses the wrong version of a frequently-revised document, emphasize the organization of disks, files, cataloging procedures in a training session.

Excessive paperwork: Watch the amount of time that authors, supervisors and typists spend filling out forms to get work to and from the word processing machine. Establish effective communication channels; be flexible about altering them to meet changing needs.

There is no all-encompassing solution to how word processing should be taught in a specific situation and at any one time with any one employee. It is probable that you will try one or all of the above methods at various times. Problems should be defined and redefined in terms of existing equipment, personnel and expectations.

Word processing bookshelf

Beginning WordStar users will welcome Walter Ettlin's book *WordStar Made Easy*. It comes complete with lessons and quick references to the commands of this complex program. The logical progression and accessible format help make initial forays into WordStar less frustrating than the difficult-to-fathom manuals provided with the program.

For more thorough explanations, the text is keyed-in to the manuals that support both the 2.X and 3.X versions. The author wisely states that the book *supplements* rather than *replaces* the manuals. For example, he does not illustrate the various help menus that appear on-screen and in the manuals.

The clearly-indexed commands are a handy reference for intermediate and advanced users. I find myself referring to the book often for commands and explanations I tend to forget because they aren't used frequently.

MailMerge and SpellStar are not supported; these would have been more helpful than the inordinate number of blank sheets that introduce each chapter. There is a heavy paper command summary at the back next to the inside back cover. The spiral binding is a plus, because when the book is placed on a desk or typing stand, it stays flat so a weight doesn't have to be placed across the pages to prevent them from slapping shut.

Offered by Osborne McGraw Hill (Berkeley, CA), the paperback volume includes 125 pages and retails for \$7.95.

Contributing editor Dona Z. Meilach is the author of over 65 books and hundreds of magazine articles on a variety of subjects. She is hooked on computers for the creative process. She is currently writing a novel, a book about computers, and is conducting author workshops and tutorials on word processing and spelling systems.



Education

Continued from page 26

on the console, just as they would be in an actual copy operation. However, while the eighth file is being copied, the process stops and the BDOS message:

DISK WRITE ERROR: =A:*. *

appears. BDOS errors should strike fear into all computer users—usually indicating that important information has been lost. The error in this case is only simulated by Teach/M.

The purpose of this is to show how to cope with one of the less serious errors. The problem is that the diskette in drive B has been filled with programs—there is no more room. A directory listing of drive B shows a file with an extension of \$\$\$\$. This is the CP/M designation for a temporary file. In this case, it indicates the name of the file that would not fit on drive B.

The student then erases some unneeded files from drive B to make room. The program STAT is subsequently executed to see if there is enough room for the remaining files from drive A.

The last lesson concludes with a friendly message suggesting that it might be a good idea to review some of the lessons. You are then given the option of returning to the menu or leaving Teach/M.

We now have five microcomputers running CP/M and operated primarily by secretaries. The major task is word processing. WordStar (MicroPro, San Rafael, CA) is ideal in this case. In addition to being a text editor and a text formatter, WordStar can be directed to perform certain systems functions such as deleting, renaming and copying disk files. However, it is occasionally necessary to directly perform systems tasks using CP/M. It is at this time that the inexperienced user can feel intimidated.

Several secretaries who were good typists, but inexperienced computer users, completed the lessons in the Teach/M package at their own pace. Without exception, all enjoyed the experiences. They expressed the feeling of learning more about CP/M and gaining confidence in the use of our microcomputers.

At this time, Teach/M is available in a limited disk format. Presumably, it will be available in all of the popular CP/M formats by the time this review appears. The version made available for review was designed for the Xerox 820 computer with 8-in. floppy disks. The program was copied to a North Star computer and an Osborne I unit. The Xerox version worked perfectly in the North Star. The Osborne, however, presented a minor problem.

The Osborne disks have a 100K-byte capacity. Consequently, the three Teach/M files could not all be placed on the same disk. Yet, Teach/M requires all three files on the same disk. The problem was solved by using Microshell (New Generation Systems, Reston, VA, reviewed in *IA* Jul 82).

Microshell overlays the regular CP/M console command processor (CCP) and adds several new features. One of these is automatic file search. Two of the Teach/M files were placed on drive B and the other was put on drive A. Disk B was made the default drive. When running under Microshell, Teach/M had no trouble locating the necessary files whether on drive A or drive B.

Teach/M is another valuable addition to the growing family of programs for computer-aided instruction and a supportive companion to Select's original word processing system (*IA* Jul 82). □

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SYSTEM REQUIREMENTS: CP/M, 56K, terminal with addressable cursor & 80 char. x 24 line screen, single or dual disk, 8" IBM or 5¼" North Star.

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128 INTERFACE AGE CIRCLE 85 ON INQUIRY CARD



Entertainment Continued from page 28 Postscript

Interestingly, everyone who has put forth a solution (so far) has agreed that there is only *one* solution to the Zebra Problem—the one we offered in the March column. The "simpleminded" program in that column would have taken a while to prove that this was the case, but all the "fast-track" solutions arrive at the same conclusion.

We said that this was a "pattern recognition" problem at the time we proposed it. Professor Conant's solution shows that it is still the *human* who spots the pattern; the computer just shuffles the pieces around once the underlying structure is recognized. At the "idiot" level, the computer can spend forever looking for the solution on its own, without human help. The computer, unless programmed to do so, would never "think" of trying a board-game approach.

Contributing editors Patrick and Leah O'Connor reside in Chicago, IL. Patrick has held the position of professor of digital electronics at DeVry Institute of Technology for 14 years. Leah does freelance computer programming and technical writing for a number of Chicago-area companies, including the Image Producers in Northbrook.

Program on page 130

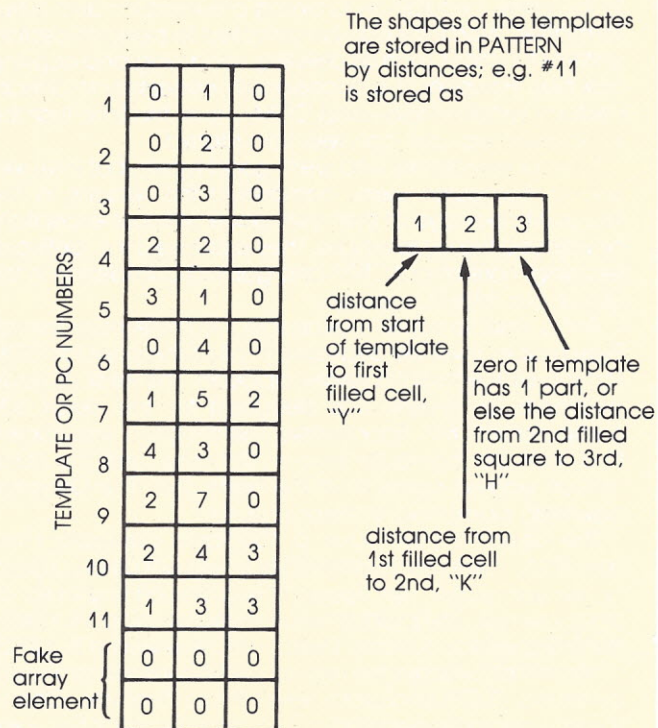


Figure 3. PATTERN Array

SEPTEMBER 1982

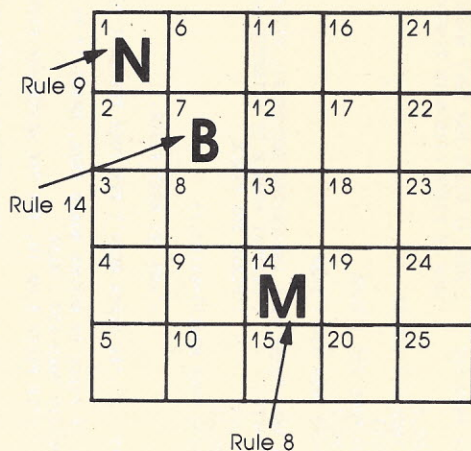


Figure 2. The Board

1	E	R	—
2	S	D	—
3	U	T	—
4	S	O	—
5	O	L	—
6	J	P	—
7	I	G	C
8	C	F	—
9	F	C	—
10	H	Y	K
11	Y	K	H

Figure 4. LETTER array
(actually numbers were used [A=1, . . . Z=26])

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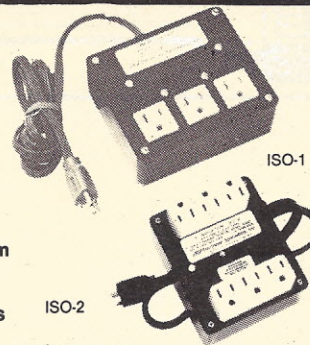
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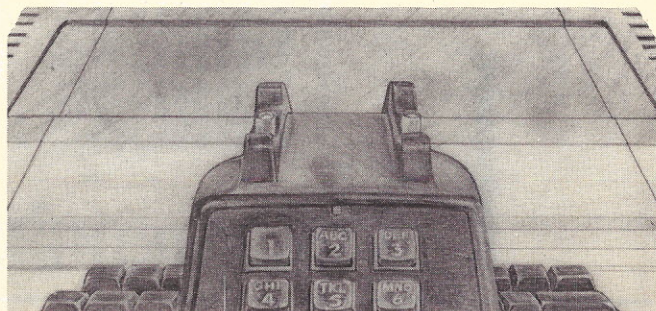
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CIRCLE 94 ON INQUIRY CARD

INTERFACE AGE 129

Entertainment

Listing 1

```

ZEBRA.FORT
00010 //INITIAL SETUP AND  INITIALIZATION OF ARRAYS, ETC.//
00020 F
00030 IMPLICIT INTEGER (A-Z)
00040 INTEGER LOC(13)/13*1/
00050 INTEGER MATRIX(25)/14,5*0,2,6*0,13,11*0/
00060 INTEGER NEXT(11)/2,3,4,5,6,7,8,10,10,12,12/
00070 INTEGER MAXLOC(11)/6*21,5*16/
00080 INTEGER FAILPC(11)/13,1,2,3,4,5,6,9,7,11,0/
00090 INTEGER PATTRN(13,3)/3*0,2,3,0,1,4,2,2,1,0,0,
00100 +1,2,3,2,1,4,5,3,7,4,3,0,0,
00110 +6*0,2,0,0,3,3,0,0/
00120 INTEGER LETTER(11,3)/5,19,21,19,15,10,9,3,6,8,25,
00130 +18,4,20,15,12,16,7,6,3,25,11,
00140 +0,0,0,0,0,0,3,0,0,11,8/
00150 F
00160 PC=1
00170 //MAIN PROGRAM STARTS HERE.//
00180 WHILE PC.LT.12 DO
00190 IF (LOC(PC).LE.MAXLOC(PC)) THEN //IF PIECE HAS NOT LEFT BOARD//
00200 FIT=0 //SEE IF IT FITS WITH PIECES THERE//
00210 L1=LOC(PC)+PATTRN(PC,1)
00220 IF (MATRIX(L1).EQ.0) THEN
00230 L2=L1+PATTRN(PC,2)
00240 IF (MATRIX(L2).EQ.0) THEN
00250 L3=L2+PATTRN(PC,3)
00260 IF (MATRIX(L3).EQ.0) THEN
00270 FIT=1
00280 ENDIF
00290 ENDIF
00300 ENDIF
00310 IF (FIT.EQ.1) THEN //IF SO, PLACE IT//
00320 MATRIX(L1)=LETTER(PC,1)
00330 MATRIX(L2)=LETTER(PC,2)
00340 IF (LETTER(PC,3).NE.0) MATRIX(L3)=LETTER(PC,3)
00350 FAILPC(11)=PC
00360 PC=NEXT(PC) //AND TRY NEXT PIECE//
00370 ELSE
00380 LOC(PC)=LOC(PC)+5 //IF NOT, TRY NEXT POSITION//
00390 ENDIF
00400 ELSE //IF PIECE IS BEYOND BOARD AREA,//
00410 LOC(PC)=1 //RESET IT TO LEFT OF BOARD//
00420 IF ((PC.EQ.8).OR.(PC.EQ.10)) THEN
00430 PC=FAILPC(PC) //IF PIECE 8 OR 10 TRY THE ALTERNATE//
00440 ELSE
00450 PC=FAILPC(PC) //FOR OTHERS, BACKTRACK BY //
00460 L1=LOC(PC)+PATTRN(PC,1)
00470 L2=L1+PATTRN(PC,2)
00480 L3=L2+PATTRN(PC,3)
00490 MATRIX(L1),MATRIX(L2),MATRIX(L3)=0 //REMOVING PIECE//
00500 LOC(PC)=LOC(PC)+5 //AND TRYING ITS NEXT POSITION//

```

```

logoff
SWAPS= 28,
CONNECT TIME(MIN)=9.38;
TRANSACTIONS= 28,
INPUT LINES= 23;
OUTPUT LINES=288;
CPU TIME(SEC)=5.30;
SRB TIME(SEC)=.75;
U08860 LOGGED OFF TSO AT 10:39:03 ON MARCH 9, 1982
LAST STEP COMPLETION CODE WAS USER 000

```

ENTER T FOR TSO/WYLBUR; C FOR CMS

Listing 2

```

10 'INITIAL SETUP AND INITIALIZATION OF ARRAYS, ETC..
40 DIM LO(13):FOR I=1 TO 13:LO(I)=1:NEXT I
50 DIM MX(25):FOR I=1 TO 25:MX(I)=0 NEXT I
55 MX(1)=14:MX(7)=2:MX(14)=13
60 DIM NX(11):FOR I=1 TO 11:READ NX(I):NEXT I
65 DATA 2,3,4,5,6,7,8,10,10,12,12
70 DIM ML(11)
72 FOR I=1 TO 6:ML(I)=21:NEXT I
74 FOR I=7 TO 11:ML(I)=16:NEXT I
80 DIM FP(11):FOR I=1 TO 11:READ FP(I):NEXT I
85 DATA 13,1,2,3,4,5,6,9,7,11,0
90 DIM PA(13,3):FOR CO=1 TO 3:FOR RW=1 TO 13:READ PA(RW,CO) NEXT RW:NEXT CO
92 DATA 0,0,0,2,3,0,1,4,2,2,1,0,0,1,2,3,2,1,4,5,3,7,4,3,0,0,0,0,0,0,0
94 DATA 2,0,0,3,3,0,0
120 DIM LT(11,3):FOR CO=1 TO 3:FOR RW=1 TO 11:READ LT(RW,CO):NEXT RW:NEXT CO
122 DATA 5,19,21,19,15,10,9,3,6,8,25,18,4,20,15,12,16,7,6,3,25,11
124 DATA 0,0,0,0,0,0,0,3,0,0,11,8
155 CT=1:PRINT"PLACEMENT NUMBER:" : 'TO DISPLAY PROGRESS OF THE SEARCH
160 PC=1
170 'MAIN PROGRAM STARTS HERE
180 IF PC=12 THEN 540
190 IF LO(PC)>ML(PC) THEN 410 : 'JUMP IF PIECE HAS LEFT BOARD. ELSE -
200 FT=0 : 'SEE IF PIECE FITS WITH PIECES THERE
210 L1=LO(PC)+PA(PC,1)
220 IF MX(L1)<>0 THEN 310 : 'ELSE
230 L2=L1+PA(PC,2)
240 IF MX(L2)<>0 THEN 310 : 'ELSE
250 L3=L2+PA(PC,3)
260 IF MX(L3)<>0 THEN 310 : 'ELSE
270 FT=1
310 IF FT<>1 THEN 380 : 'ELSE FT=1 INDICATING SUCCESSFUL FIT SO -
315 PRINT CT,:CT=CT+1 : 'DISPLAY NUMBER OF ATTEMPTS SO FAR
320 MX(L1)=LT(PC,1) : 'PLACE THE PIECE
330 MX(L2)=LT(PC,2)
340 IF LT(PC,3)<>0 THEN MX(L3)=LT(PC,3)
350 FP(11)=PC
360 PC=NX(PC) : 'AND TRY NEXT PIECE.
365 GOTO 390
380 LO(PC)=LO(PC)+5 : 'IF PIECE DOSN'T FIT THEN TRY NEXT POSITION.
390 GOTO 520
410 LO(PC)=1 : 'IF PIECE IS BEYOND BOARD AREA, RESET IT TO LEFT OF BOARD
420 IF PC<>8 AND PC<>10 THEN 450 : 'ELSE
430 PC=FP(PC) : 'IF PIECE 8 OR 10, TRY THE ALTERNATE PIECE 9 OR 11
440 GOTO 510
450 PC=FP(PC) : 'FOR OTHERS, BACKTRACK BY
460 L1=LO(PC)+PA(PC,1)
470 L2=L1+PA(PC,2)

```




```

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00980
00990
01000

```

```

ENDIF
ENDIF
REPEAT
//HERE WE HAVE EITHER FAILED OR SUCCEEDED.//
IF (PC.EQ.13) THEN
WRITE(6,700)
ELSE
WRITE(6,701)
FOR I=1 TO 5 DO
WRITE(6,710)(MATRIX(5*(J-1)+1),J=1 5)
REPEAT
STOP
700 FORMAT(' FAILED TO FIND ANY SOLUTION.')
701 FORMAT(' MATRIX SOLUTION: '///)
710 FORMAT(' ',5I3)
END
EOJ
READY

```

```

480 L3=L2+PA(PC,3)
490 MX(L1)=0:MX(L2)=0:MX(L3)=0
500 LO(PC)=LO(PC)+5
510 GOTO 520
520 GOTO 530
530 GOTO 180
535 'HERE WE HAVE EITHER FAILED OR SUCCEEDED.
540 IF PC<13 THEN GOTO 570 'ELSE
550 PRINT "FAILED TO FIND A SOLUTION."
555 STOP
570 PRINT:PRINT "MATRIX SOLUTION:":PRINT
572 DIM ALS(27):FOR I=1 TO 26:READ ALS(I):NEXT I
574 DATA "A","B","C","D","E","F","G","H","I","J","K","L","M","N","O"
576 DATA "P","Q","R","S","T","U","V","W","X","Y","Z",""
580 FOR I=1 TO 5:
FOR J=1 TO 5:N=5*(J-1)+I:M=MX(N):IF M=0 THEN M=27
590 PRINT USING "@@;ALS(N):NEXT J:PRINT
592 PRINT USING "@@;ALS(N):NEXT J:PRINT
600 NEXT I
610 END

```

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Portables Continued from page 30

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Variables used

- A = Accumulated surface area
- B = Accumulated area of border or trim
- C = Coverage expected per unit, in square feet
- D = Cost per unit
- E = Cost per square foot
- H = Height of walls
- IS = Temporary value
- J = Linear feet of trim to be painted
- K = Number of square feet, estimated, in an average linear foot or trim
- P = Printer flag. Set P=1 for printer use, otherwise 0
- T = Accumulated total cost.
- US = Unit of coverage, such as gallons, square yards, etc.
- V = Temporary value
- W = Width or height of a rectangular area
- X = Counter
- Y = Temporary value
- Z = Temporary value

Program listing

```
5: " ": PRINT "ESTIMATOR"
: P=1
- Use ENTER only for "yes".
: INPUT "USE PRINTER? ";IS
: P=0
10: PAUSE "MENU"
: PRINT "A-AREAS C-INTERIOR"
: GO TO 10
@@@ ACCUMULATE AREA COSTS @@@
```

```
100: "A": PRINT "AREAS"
- Set for accumulation of areas.
: A=0
- Set for total cost accumulation.
: T=0
- Set count of areas.
: X=0
105: X=X+1
: PRINT "AREA #";X
- Get an area.
: GO SUB 800
- Accumulate to total area.
: A=A+Y
- Use ENTER only for yes.
: INPUT "ALL AREAS ENTERED? ";IS
- Return for another area on any entry.
: GO TO 105
110: PRINT "TOT AREA=";A
- Get costs for coverage.
115: GO SUB 840
- Accumulate to total cost.
: T=T+Z
- Use ENTER only if yes.
: INPUT "ALL COSTS ENTERED? ";IS
- Return for further entry on any input.
: GO TO 115
- Wrap.
120: PRINT "TOT COST=$";T
- Return to menu.
: GO TO 10
@@@ PAINT A ROOM @@@
200: "C": PRINT "INTERIORS"
- Set for accumulation of surface areas.
: A=0
- Set for accumulation of trim costs.
: V=0
- Set for total cost accumulation.
: T=0
- Set for accumulation of trim to be finished.
: J=0
- Set for count of rooms.
: X=0
- Get appropriate number of square feet in a linear foot of trim.
.5 may be a good estimate.
```



```

: INPUT "SQ FT/FOOT OF TRIM? ";K
205: IF P PRINT K;" SQ FT/FT"
210: X=X+1
: PRINT "ROOM #";X
- Get average height of walls.
: INPUT "HT? ";H
: IF P PRINT "HT=";H
- Get width and length.
215: GO SUB 800
- Use ENTER only for yes.
: INPUT "EXCLUDE CEILING? ";I$
- Accumulate area of ceiling.
: A=A+Y
- Compute wall area and
accumulate.
220: A=A+Z*H
- Subtract area of doors to be
covered and accumulate as trim.
Use ENTER only if any door.
: INPUT "ANY DOOR? ";I$
- Skip if any entry.
: GO TO 250
- Get dimensions.
225: GO SUB 800
- Accumulate area of one side
of door.
: J=J+Y
- Decrease wall surface area.
: A=A-Y
- Use ENTER only if only one side
of door to be covered.
: INPUT "ONE SIDE ONLY? ";I$
- Accumulate for second side if
any entry.
: J=J+Y
- Accumulate for door jam.
230: J=J+(Z-L)*K
: INPUT "ANOTHER DOOR? ";I$
- Exit on any entry.
: GO TO 250
235: GO TO 225
- Subtract any areas not to be
covered, such as windows, arch-
ways, paneled areas, etc.
250: INPUT "SUBTRACT AN AREA? ";I$
- Exit on any entry.
: GO TO 300
- Get dimensions.
255: GO SUB 800
- Subtract area.
: A=A-Y

```

```

- Is there any trim to be
covered?
: INPUT "ANY TRIM? ";I$
- Exit on any entry.
: GO TO 275
260: INPUT "FOUR SIDES? ";I$
- Skip if no.
: GO TO 270
- Add trim for all four sides.
265: J=J+Z*K
: GO TO 275
- Add trim for base only.
270: J=J+L*K
275: INPUT "ANOTHER AREA? ";I$
- Skip to next section if no.
: GO TO 300
280: GO TO 255
300: INPUT "ANOTHER ROOM? ";I$
- Go to costs, if no.

```

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```
: GO TO 350
- Return if yes.
305: GO TO 210
350: PRINT "SURFACE COST"
- Get costs of walls.
355: GO SUB 840
- Accumulate total cost.
: T=T+Z

: INPUT "ALL COST ENTERED? ";I$
- Return, if no.
: GO TO 355
360: PRINT "TOT SURFACE"
: PRINT "COST=$";T
- Compute trim costs. Move accumulated surface area to A for subroutine.
: A=J
: PRINT "TRIM COST"
- Get costs.
365: GO SUB 840
- Accumulate to total cost.
: V=V+Z
: INPUT "ALL COST ENTERED? ";I$
- Return if no.
: GO TO 365
370: PRINT "TRIM COST=$";V
- Accumulate to total cost.
: T=T+V
: PRINT "TOT COST=$";T
- Return to menu.
: GO TO 10
- SUB: Compute an area.
800: L=0
: W=0
: INPUT "LEN/BASE? ";L
: INPUT "WID/HT? ";W
- Test to see both items entered.
805: IF (L=0)+(W=0)>0 PRINT "BAD ENTRY"
: GO TO 800
- Output to printer if flag set.
810: IF P PRINT "LEN/BASE=";L
: PRINT "WID/HT=";W
- Compute area.
815: Y=L*W
- Compute perimeter.
```

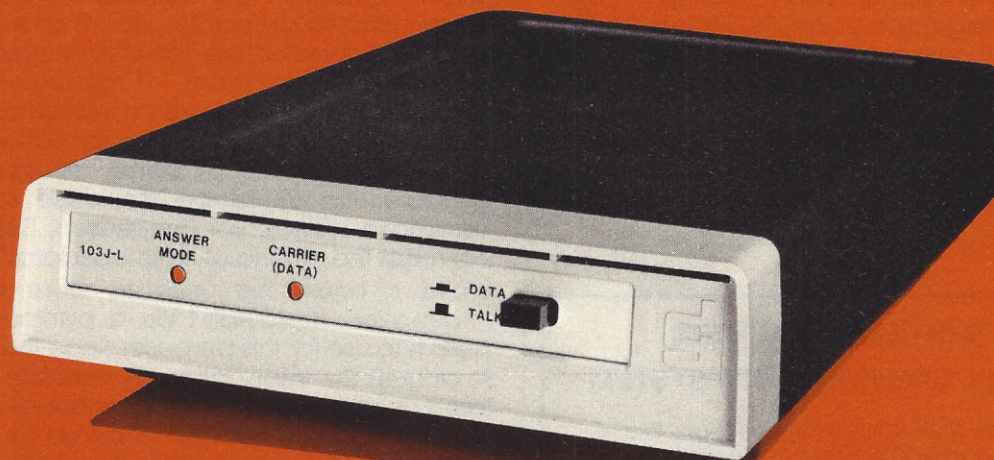
```
: Z=2*L+2*W
: RETURN
- SUB: Get cost per unit of coverage.
- Get unit of coverage to be used, such as SQ YDS for carpet or GALS for paint.
840: INPUT "UNIT OF COVERAGE? ";U$
: IF P PRINT "UNIT IS ";U$
- Get coverage of above unit in square feet. For example, use 27 square feet in a square yard. If gallons of paint, give expected coverage, such as 320 square feet per gallon.
845: INPUT "COVERAGE(SQ FT)? ";C
: IF P PRINT "COV=";C;" SQ FT"
- Get cost per unit.
850: INPUT "COST/UNIT? $";D
: IF PRINT "$";D;" / ";U$
855: Z=0
- Get error percentage estimate. Use ENTER only for zero.
: INPUT "SUB ERROR(%)? ";Z
: IF P PRINT "SUB ";Z;"%"
- Decrease coverage by error percent.
860: C=C-Z*C/100
- Compute and display cost/ft for this entry.
: E=INT(D/C*100+.5)/100
: PRINT "$";E;" / SQ FT"
- Continue to next routine.
- Find number of units required.
880: Z=A/C
- Round to next unit.
: Y=INT(Z+1)
: PRINT Y;" ";U$;" REQUIRED"
- Compute percent of last unit to be used.
: Z=INT((1-Y+Z)*100)
: PRINT Z;"% OF LAST ";U$
- Compute dollar cost.
885: Z=Y*D
: PRINT COST OF ";Y;" ";U$
: PRINT "IS $";Z
: RETURN
999: END
```


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CIRCLE 43 ON INQUIRY CARD

INTERFACE AGE 135

DataFax

Continued from page 43

the descriptions on the database folders—or indexes by which items are found. Folders can have multiple keywords—as many as required. When searching for information, or to retrieve a folder, the user specifies the desired keywords or combinations. The system then identifies which folders are available. The first line of the folder is printed and the user has the option of choosing the folder for printing, adding information or editing it.

Folders can be more than one "page" or screen in length. However, each page is stored by keyword. This provides the capability for generating a filing system linked by page number (for example, in chronological order) and in keyword order.

The examine command allows the user to review folders one-by-one. It's equivalent to leafing through the files, examining each page. Scanning, on the other hand, just pulls those folders specified by keywords. A folder may be deleted at any time—or printed out.

There are a number of commands that can be invoked in the editor. These include commands that allow the user to go from one page to the next

in a folder, to insert a new page in a folder, either in the middle or at the end, and copy pages. They are easy to use. The user must simply remember to get to them by entering control-s.

There is no real report generator for this system, other than to print out what is stored in the file

The program represents a different approach to the problem of storage and retrieval

folder—verbatim. Considering the nature of the system and its probable uses, that suffices.

As mentioned before, the data in any one screen is entirely in "free format." There are no "forms" or other restraints. There are no variables or special locations for information. All information is entered as text—and stored by page, as opposed to by variable, as would be the case in a typical database system. For this reason, DataFax does not meet the criteria of a typical database system. While it could be used to store accounting information, it wouldn't be a particularly viable system to use for this purpose, since there is no way to access the information by variable or manipulate it. Further, since the screens are all free-format, it would be very difficult to set up forms such as data entry sequences. While the system does allow the user to copy a folder, doing so just creates a mirror image of the folder that must then be "keyed" and saved. This method could be used to create "forms" or data entry formats, but it would be comparatively inefficient, primarily because there is no protection for the formats. Information could be written over them freely, and there is no provision for jumping from one data entry position to another, as is common in most data entry sequences.

This database system is most suitable for applications that do not require access and manipulation of information. A number of good uses exist, including: Telephone notes; Daily journal; Personnel evaluation and Sales Call records.

DataFax represents a different approach to the problem of database information storage and retrieval. The program is something like Visidex (Visicorp, Sunnyvale, CA) and PFS (Software Publishing Co., Mountain View, CA) but without the data entry structure provided by those programs. Accordingly, the system is useful in a situation in which "free-format" information, such as telephone notes or minutes of meetings must be kept, and fills a certain niche in the available software for business and personal use. □

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MicroFinesse Continued from page 50

mnemonic sequences. I found myself keeping a written log of file names, and their contents. The scarcity of text space also affects column headings—they may be only five characters each—too short for some desirable titles. The columns themselves can be only five to nine characters wide. And if you select bracketing, there is even less space for the figures. The program compensates for narrow columns with an Autoscaling feature that cuts off digits and adds a K for thousands, an M for millions or * (signifying a larger value). Numbers too wide for your columns are printed in scientific notation, such as 438.45E7, meaning 4,384,500,000, with some loss of accuracy due to truncation. The system can print only 0, 1 or 2 decimal places. This is adequate for financial work, but prevents the use of MicroFinesse for other quantitative modeling.

The model itself accommodates only 5,000 cells—which will not accommodate some of the more elaborate calculations that may be desired.

Another area where MicroFinesse shows itself to be out of date is in its Reporting capabilities. No Report can be longer than 50 lines, a serious consideration for people who want extensive reports from specialized or large-scale application models. In addition, formatting a Report is a roundabout process, with some of the specifications being part of the Model itself and others part of a special Report format file. For example, you call for any Totals in the Report format file, but you call for any Averages in the Names file. With practice, it's possible to achieve decent Reports, but the process can be a challenge.

Another inconvenience is the need to re-compile the Model logic every time a change is made. The program automatically deletes the compiled version of a Model if you simply enter the Editor with the source code loaded. This means you have to be extremely careful. For example, disks must be switched if you want to create several slightly different variations of a given model set-up.

There are a few other annoying items. The key-strokes to exit various subroutines are not uniform. Sometimes a "-" will get you out, sometimes a carriage-return is needed. This may not be the most important thing to redesign, but a good program should have a more consistent command structure.

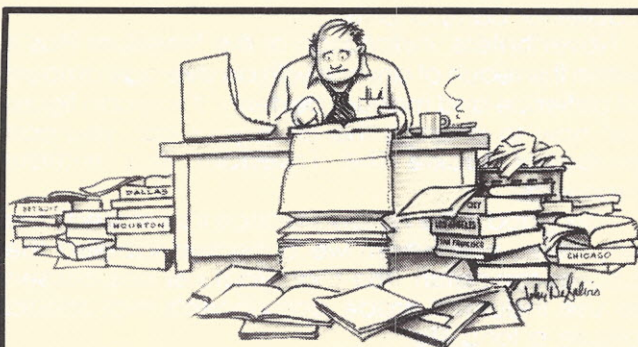
The manual is attractive, nicely prepared, and quaint—with its use of "centre" and other British-isms. There are over 100 pages of procedures and explanations of the program, item by item. The necessary information is there, but the limited index makes it difficult to refer quickly to some minor items. For example: "suppression codes" are an important element in Report formatting, but there is no specific reference to them anywhere in the Index or the Table of Contents.

The documentation has some inconsistent references. The same display screen is referred to as a "file utility menu" at one time and an "option menu" at another. Other confusing explanations include both "exchanging" and "changing" in the same paragraph to describe how model values can be altered, and calling the same file a "destination" in one sentence and an "accumulator" in the next.

Some of the explanations of how to use features are vague, but the biggest problem is the lack of adequate examples. Many are promised; few are delivered.

Overall, MicroFinesse is a useful program for experienced users, but novices might find it somewhat difficult. □

Contributing editor Robert Moskowitz is a full-time management consultant and business writer. He has authored management programs and produced industrial training films. He wrote How to Organize Your Work and Your Life (Doubleday) and has contributed to numerous publications. He is currently Editor-in-Chief of Executive Productivity and Office Technology Management and recently developed the computerized Personal Productivity Audit system.



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Freedom Plus **Continued from page 70**

back on. There's virtually no room to spare. In one sense, the tightness of the fit is a positive point, since it keeps the two boards solidly plugged together, but you may have trouble getting the keyboard case to close as tightly as you'd like.

In the Model III, the Freedom Plus plugs into the circuit board that stands vertically at the back of the cabinet. Although installation is comparatively straightforward in the Model III, it's harder to get things aligned properly. Read the instruction manual carefully, paying particular attention to the photos. These illustrate certain details not fully explained in the text.

As with the Model I version, the pins on the bottom of the Model III Freedom Plus are barely long enough to reach. You may find, as we did, that you must do some experimenting before you can get it properly inserted. Once again, the plug-in board is a very tight fit.

A warning about installation of either version: You can get yourself into trouble. First, you will void your 90-day warranty if you open the case on a new machine. Second, you will damage your computer if you are careless. You must take precautions to prevent static electricity (which can harm delicate circuitry) and to avoid breaking cables or components.

Nevertheless, installation of the Freedom Plus is within the reach of anyone with an average amount of patience and manual dexterity. If you can figure out how to change the oil in your car, you can probably tackle the Freedom Plus without problems.

How good is the hardware once it's installed? The engineers with whom we consulted labeled the boards top-notch. The manufacturer has chosen to use industrial-grade components that should assure a long life.

It seems safe to say that the Freedom Plus is of higher-quality construction than the computer it plugs into. The unit uses the existing TRS-80 power supply (except for the real-time clock, which has its own long-life lithium battery). The board draws an additional 10%, which is within the power supply's limits.

The designers deserve a round of applause for an elegant solution to a difficult engineering problem. The plug-in module is entirely transparent to the user. Your TRSDOS programs will run without modification and without loss of speed. Insert a TRSDOS disk and you find yourself with the 48K byte machine to which you are accustomed. Insert a CP/M disk (or the company's CP/M-compatible T8-OS) and you have a 64K-byte CP/M machine. It's that simple.

Model I users should note that they will want to have a doubler unit installed to take full advantage

of the Freedom Plus. The board supports single-density, but without double-density disk storage, you will have a hard time using your Model I for serious business applications. In the CP/M mode, 35-track single-density diskettes hold only 70K bytes, so you'll find yourself running out of headroom almost immediately. If you have a doubler in your Model I, the T8-OS operating system will take advantage of it automatically, without needing any patches.

Not all Model IIIs work with the Freedom Plus. About 10% are plagued by slow memory chips. Apparently, Radio Shack substituted less efficient

The Freedom Plus is of higher-quality construction than the TRS-80 itself...

chips in some of its machines. Although this does not affect the operation of the Model III in the 48K mode, the 64K version requires faster memory chips. The problem is solved by replacing the offenders. Freedom Technology told us that any Model III owner with this problem can buy faster chips from the company for about \$25. Replacement is a quick and simple task—pull the old chips out, plug the new ones in.

What about software? Will the Freedom Plus board run large CP/M programs as advertised? The answer is Yes—if you buy versions that work with the TRS-80's 64-column screen (some CP/M programs need an 80-column screen). To its credit, Freedom Technology has made arrangements with major software vendors such as Lifeboat, Microsoft, MicroPro and Peachtree. Although we could not try every program, those we tested ran without a hitch.

As of this writing, you can order software from the major software vendors or directly from Freedom Technology, which will configure it for your system. Call the company for an up-to-date list of the programs that will work with the 64-column screen. Most of the big names—WordStar, dBASEII, Peachtree—are already available.

Perhaps the most exciting part of the package is the CP/M-compatible operating system called T8-OS. You can order standard CP/M 2.2, but many buyers may want to consider T8-OS instead. CP/M was originally written for the 8080 microprocessor, the forerunner of the Z80 chip found in the TRS-80 and many other small computers.

T8-OS, on the other hand, is written in Z80 code. That makes it faster and more efficient.

Even more important than the efficiency of T8-OS is its flexibility. With a utility called TCHANGE, for instance, you can configure your Freedom Plus-equipped TRS-80 to run any combination of disk drives. You can have a single-density 35-track 5¼-in. drive sitting next to an 80-track double-density drive. Just tell T8-OS which is which. Would you like to add an 8-in. drive? Plug it in and run the TCHANGE utility again. Describe the new configuration to T8-OS and it will remember.

The TCHANGE utility alone puts its head and shoulders above standard CP/M, but T8-OS has additional features. Consider, for instance, its automatic density recognition, which allows you to mix and match single- and double-density diskettes. If T8-OS can't read a diskette in one density, it tries again in the other. (Model I users must have a doubler installed to read double-density).

Amateurish organization and writing plague the user's manual. Despite a rudimentary contents page that divides the manual into sections, the author apparently wrote things down as they

occurred to him. Crucial warnings are mixed in with non-essential details. Technical jargon sits side-by-side with instructions for laypeople. There are no sample screens, no sample files, no tutorials and few step-by-step guides.

One section is preceded by the notice that it contains technical material and "you need neither read it nor understand it to operate T8-OS." Yet nearby—close enough for confusion—is the most important warning of the entire manual. If you skip that section and miss the warning, you are likely to ruin many diskettes.

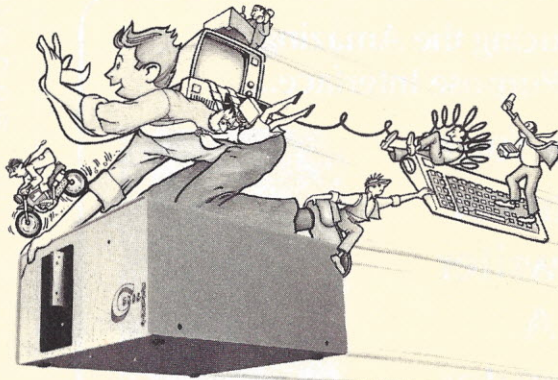
Unclear instructions

The manual often instructs you to do something . . . but doesn't explain how. It warns you to depress Control-C every time you change a diskette . . . but instructions about the control key are buried elsewhere in the manual. Likewise, it mentions the valuable TCHANGE utility without explaining how to make full use of its power and flexibility.

The manual gives a few tips on installing WordStar, but falls far short of telling you all you need.

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The price for I(nterchange) is \$59.95 and the manual is available for \$10.00 (credited towards purchase). I(nterchange) is recommended for 32K or larger systems using CP/M™ 2.0 or later. It will not run on an 8080 CPU and only User 0 is supported.

All programs are available on 8" SD or North Star 5¼" disk. Microstat is available for North Star Basic, Microsoft's Basic-80 (Rel. 5.0 or later) or compiler Systems CBasic2. Please specify when ordering.

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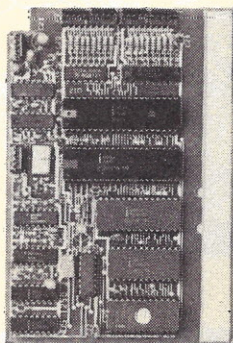
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140 INTERFACE AGE

WordStar works best if it is copied onto a system disk together with certain utilities for formatting and copying diskettes. First-time users need guidance in setting up such a diskette—they won't find it in this manual.

Worse yet—the manual we received did not include any error codes or explanations, even though the contents page promised such help. As we tested the system, we often got error messages or crashed completely. The manual gave no assistance.

Because of the current state of the manual, it will take hours of experimentation to learn the ins and outs of T8-OS and to understand how it differs from TRSDOS and CP/M. If you don't have a lot of technical know-how, prepare yourself to spend time talking to the company on the phone while trying to get things up and running.

However, two things make the Freedom Plus worthwhile, despite the inadequate documentation. First, the company offers a 30-day money back guarantee. If you find you can't get the unit to work, you can return it for a refund. Second, the company has future plans that will enhance the value of this product.

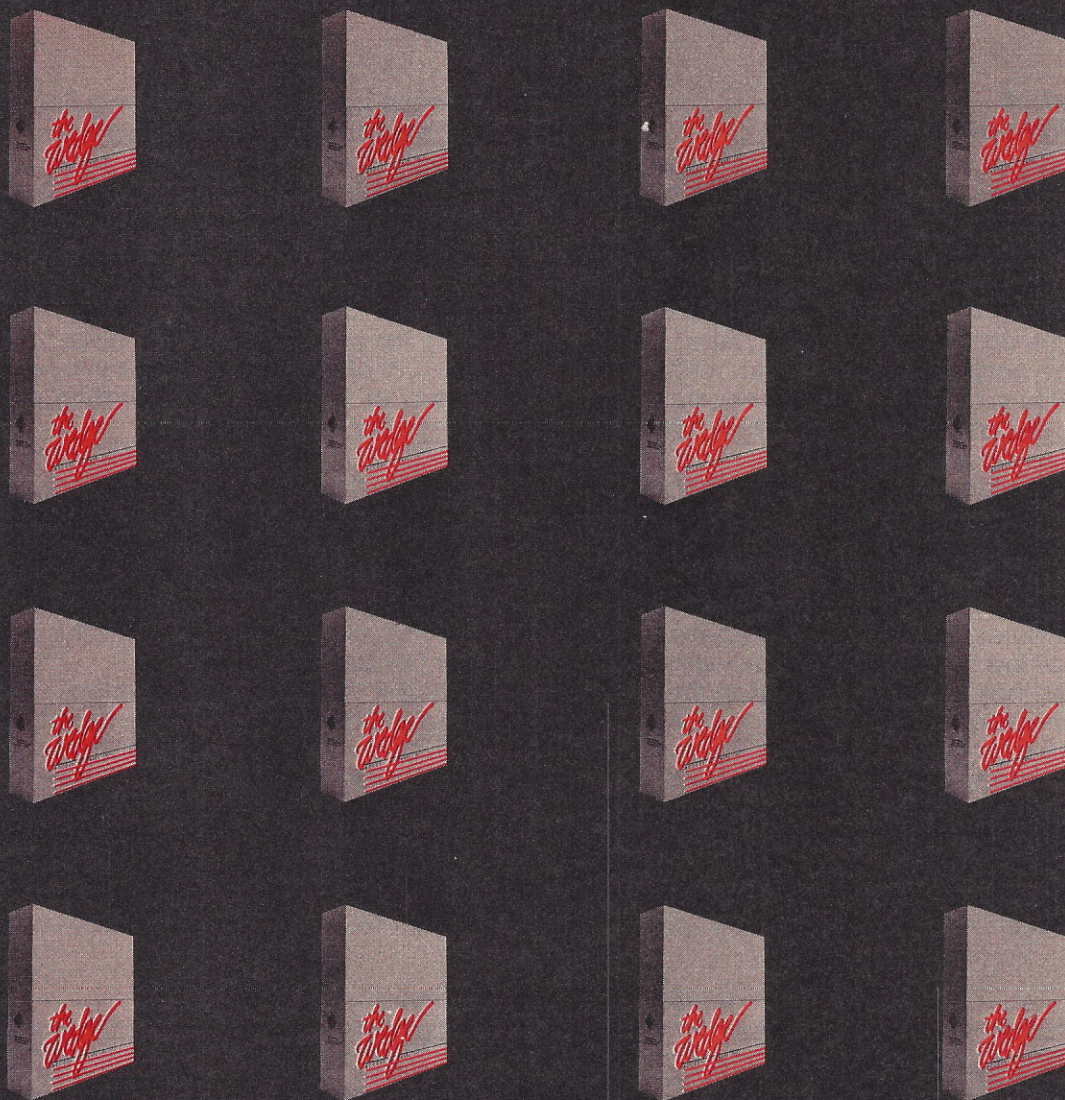
Normally, it is not advisable to buy on the basis of future plans. But Freedom Technology is moving ahead so quickly that many of these things may be completed by the time this article reaches print. Check with the company before you make a decision. Here are some of the projects now in the works:

- a professionally-written manual
- an 80-by-24 video board that will work together with the Freedom Plus board (no more 64-column limitation)
- a network of dealers trained to install and maintain the boards
- a tie-in with a nationally-known software house to sell a "bundled" product—hardware, operating system and applications software in one package.
- hard disk compatibility
- additional utilities for T8-OS, including a quick copy routine, a queuing routine and a user-friendly "supervisor" utility.

With enhancements like these, the Freedom Plus could be one of the most important developments the TRS-80 world has seen in a long while. It could add years to the useful lives of the Models I and III while catapulting them into the big leagues of business computing. □

Jesse Berst is Associate Editor of Interactive Computing, the monthly journal of the Association of Computer Users, (Boulder, CO). He has co-authored two computer books and makes regular contributions to an array of trade and business journals.

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TRS-80 Model 16

Continued from page 73

doubles disk capacity to a total of 1.25M bytes. Two of the drives fit into the same space as the original single drive on the Model II. A single drive version is available if you plan on using the hard disk option. Other improvements include a green phosphor CRT monitor, a higher-capacity power supply, and a slightly more attractive desktop system.

Consider the system relative to the MC68000. This 16/32 bit CPU runs at 6 MHz and directly accesses up to 512K bytes of RAM, although only 128K are included in the basic system. The memory board will accept another 128K and one additional memory board (256K) can be added for a full capacity system. (Even though all of this memory is available, the Z80A still only accesses 64K bytes.)

All this memory might seem like over-kill for a desktop computer, but programs that can take advantage of the increased memory will usually operate faster than if the same program operates from a disk—whether hard or floppy. Another benefit of the increased memory is the ability to provide larger segments for multiple users.

The Model 16 incorporates a memory management scheme that helps to allocate and protect this extensive storage area. A protected segment of the memory is assigned to the operating system and other programs if required. Three separate

user areas can also be reserved, thereby giving each program *dedicated* memory space.

Though the software has been improved, compatibility with the former system has been maintained. Three operating systems are supplied with the Model 16: TRSDOS 2.0b, TRSDOS-II and TRSDOS-16. All three offer essentially the same set of commands for most functions, so it may be difficult for most users to be able to determine which is in effect. The big advantage to this is in the ease of learning the operating systems and moving from one to another.

TRSDOS 2.0b, a slightly modified version of the present Model II operating system, is provided so existing software will run without modifications on the Model 16. The reason for the 2.0b revision is the different timing parameters for the thinline disk drives. If you have Model II and decide to upgrade with the Model 16 enhancement, this modification would not be necessary.

TRSDOS-II has been converted for use with the higher capacity, 32-sectors-per-track diskettes. It includes a facility to transfer existing files from the older format (FCOPY). Also included are the hard disk operating system extensions. These allow full access with double-sided floppies as well as up to four hard disk drives—a total of almost 36M bytes.

TRSDOS-16 has been specifically designed for

Model 16 Operating Systems

	TRSDOS-16	TRSDOS-II	TRSDOS
Mode	Model 16 (68000 code)	Model II (Z80 code)	Model II (Z80 code)
Start-up	with TRSDOS-16/TRSDOS-II in primary drive, enter date and time	with TRSDOS-II in primary drive, press <HOLD>, then enter date and time	with TRSDOS in primary drive, enter date and time
Switching to:			
TRSDOS-16	not applicable	at "Ready," enter: BOOT16 TRSDOS16/SYS	at "READY" with TRSDOS-16 in primary drive, press RESET
TRSDOS-II	at "Ready," press RESET and <HOLD> before date	not applicable	at "READY" with TRSDOS-II in primary drive, press RESET and <HOLD> before date
TRSDOS	at "Ready" with TRSDOS in Drive 0, press RESET (if hard disk, press <REPEAT> <BREAK>)	at "Ready" with TRSDOS in Drive 0, press RESET (if hard disk, press <REPEAT> <BREAK>)	not applicable
Type of disks recognized	single- and double-sided diskettes, and hard disks	single- and double-sided diskettes, and hard disks	single-sided diskettes only
Transferring disk files to hard disk	at "Ready" enter MOVE <i>source</i> TO <i>destination</i> . Example: MOVE 1 to 4 (ALL)	at "Ready" enter MOVE <i>source</i> TO <i>destination</i> . Example: MOVE 1 to 4 (ALL)	must transfer to TRSDOS-II. at "TRSDOS-II Ready" enter: FCOPY <i>source</i> TO <i>destination</i> Example: FCOPY 1 TO 4 (ALL)
Formatting:			
single drive	not allowed	not allowed	at "Ready" enter: FORMAT 0
multi-drives	at "Ready" enter FORMAT <i>drive</i> . Example: FORMAT 1	at "Ready" enter FORMAT <i>drive</i> . Example: FORMAT 1	at "READY" enter: FORMAT <i>drive</i> . Example: FORMAT 1 (must format first)
Backup	(formatting is automatic)	(formatting is automatic)	
single drive	not allowed	not allowed	at "READY" enter: BACKUP 0 to 0
multi-drives	at "Ready" enter BACKUP <i>source</i> TO <i>destination</i> . Example: BACKUP 0 TO 1	at "Ready" enter: BACKUP <i>source</i> TO <i>destination</i> . Example: BACKUP 0 TO 1	at "READY" enter: BACKUP <i>source</i> TO <i>destination</i> . Example: BACKUP 0 TO 1

the new computer. It, like TRSDOS-II, employs the more efficient way of formatting diskettes that was introduced with the TRS hard disk system. This formatting technique greatly increases the storage capacity of the floppy diskette. The new operating systems allocate information by sectors rather than granules—thereby minimizing wasted space. Flawed areas are locked out by sectors—rather than by tracks, as with TRSDOS. The number of files is variable up to 1,220; with TRSDOS it is fixed at 96.

By the end of this year, an enhanced multiuser, multitasking operating system will be available for the Model 16, allowing two remote terminals plus the built-in terminal to all operate simultaneously. Multiple tasks can be set up from any terminal, thereby increasing the system usefulness and minimizing user frustration when finding a system already in use.

The accompanying chart compares the three operating systems supplied with the Model 16 and illustrates some of the enhanced features of the newer operating systems. One particularly convenient enhancement allows the operator to duplicate a diskette fresh out of the package, since it does not have to be formatted in order to use it as a backup. A complete double-sided floppy backup can be accomplished in about 5 minutes—less time than it takes a single sided backup on the model 11 *after* formatting.

No application software is presently offered for the TRSDOS-16 operating system; however, the 68000 assembler and a companion text editor are included with the system, allowing the sophisticated user to write custom software in 68000 assembly language. A linker is provided, so that multiple intermediate files can be joined together into an absolute program that the 68000 can operate directly. Application software from Radio Shack is anticipated to be available next year. The first series will be the business programs presently written in Cobol. They can easily be modified to operate with the improved Model 16 Cobol compiler soon to be released.

Documentation, as with all Radio Shack computers, is superb. The TRS-80 Model 16 (\$4,999, 1 disk; \$5,798, 2 disks) is supplied with three separate three-ring binders. The *Model 16 Owners Manual*, *Model 11 Mode* describes all of the functions that are supported by the Z80A. It describes each command and includes examples of use. Half of the book is devoted to the Basic interpreter. The second manual is for the Model 16 mode and—like its 8-bit counterpart—fully describes all system operations. Both manuals are well indexed; even the novice will be able to locate necessary information quite easily.

The third manual will be used by the more experienced or more adventuresome user. The *Software Library*, *Assembler 16/Editor 16* includes

a description of the 68000 assembly language and the associated assembler in the normal Radio Shack tradition. The text editor offers many of the same commands available in the more familiar editors like that of CP/M. A section of the manual discusses the linker and the philosophy of combining object modules into one monolithic program.

Even with all of the improvements, a few minor problem areas need to be discussed. First of all, formatting is not allowed on a single drive Model 16, so the second drive (\$799) is a necessity unless the 8.4M byte hard disk (\$4,495) is included.

Another long time oversight is the lack of any bell or audible annunciator. This is not actually necessary for the "margin-bell" associated with typing, since most word processors automatically take care of that. But it would be handy to sound a tone at the end of a lengthy processing session so the operator does not have to continue checking on job status. This could be added to a "DO" file (similar to SUBMIT) to provide an audible announcement. Errors and other system states could also be indicated.

Another area of concern to the prospective user is the lack of software available for the 16 mode of operation. As mentioned, there will be Cobol and some applications programs, but a Basic interpreter is not scheduled. It looks as if a Basic compiler may be available before an interpreter. No word processor is planned for the 16 mode and the very practical Scripsit is one of the few programs that *cannot* be modified to operate under the new operating system. It will, however, operate on the model 16 when using TRSDOS 2.0b.

The shortcomings of the TRS-80 Model 16 are relatively insignificant and will probably have little effect on system performance or user satisfaction. Radio Shack and others will be developing new hardware and software to increase performance and flexibility. CP/M, already available for the Model 11, will be upgraded for the newer disk format, as will a number of other third party software products. It is likely that a Unix operating system compatible with the Model 16 might be introduced by an insightful vendor, thus opening a whole new marketplace of software for the system. This desktop system appears to have a promising future. □

Technical editor Terry Benson has generated numerous articles for IA, almost since its inception. For almost five years, he provided technical assistance to many Intel Corp. customers throughout the Western U.S. as a field application engineer. Since leaving Intel, he has been working as an independent consultant supporting a wide range of microcomputer applications.

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Buyer's Guide

Continued from page 77

The complete payroll package should deal effectively with each of the above. Trust the computer with all your data—especially sensitive data such as payroll—and some power line glitch or a deviant little micro-chip will inevitably mess it up. Design should be such that the integrity of the data will be somewhat protected.

The concern for security often escalates to paranoia. Unless you're using a hard-disk system, the best form of security is a locked file cabinet with the program and data diskettes safely stored along with all the blank checks. Although almost every system includes some form of password protection, in many cases it's more of a bother than it's worth.

It might be wise to plan on keeping the micro under supervision in your office. Users have sometimes assumed they can control payroll by controlling the checks. After all, the bank wouldn't cash a check that they didn't sign, right? Wrong. There are many things that can be done to a payroll system to create a beneficial situation for one employee. Consider the employee who craftily changed the withholding files to transfer amounts from her boss's withholding and credit it to her own. A clever way to increase a tax refund, this theft wasn't discovered until several years later during an IRS audit.

Computerizing payroll can be a particularly rewarding application for your microcomputer. Properly approached, with the right help and the appropriate program, the process results in time savings, increased accuracy and improved efficiency.

The charts that follow are based upon information supplied during polls we conducted among various software manufacturers. While comprehensive, the list cannot possibly include all worthwhile payroll packages on the market. However, the list includes many excellent choices for the discriminating buyer. An effort will be made to include any omissions in forthcoming updates to our ongoing series of software reports. □

Contributing editor Carl Heintz has spoken on microcomputers before discussion groups of the California Society of CPAs. He has taught accounting at both USC and UCLA and received undergraduate and graduate degrees in business administration from the former. He has made numerous presentations on business topics before civic and business groups, including a series to the American Management Associations. In addition to many articles, Mr. Heintz has two books to his credit.

Charts follow

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Chart 1. Company and configuration data

Company	Hardware	Operating System	Price	Other Programs in Series	Comments
Advanced Data Systems 4010 Long Beach Blvd. Long Beach, CA 90807	IBM System 34 IBM System 3	DOS	\$1,500 (5¼-in. at \$545)	G/L, A/R, A/P, Job cost, Fixed assets	—
BPI Systems 3423 Guadalupe Austin, TX 78705	Apple II & III emulation NEC Computers Commodore 8050, 8032	DOS with Applesoft	\$395	G/L, A/R, A/P, Job cost	update service available; tax table for all states; disability insurance
Broderbund Software Inc. 1938 Fourth Street San Rafael, CA 94901	Apple II, III, 2 disk drives	USCD Pascal	\$395	G/L, A/R, A/P	user-friendly
Business Microproducts 1906 RD 132 Glenwood Springs, CO 81601	TRS 80 Models I & II	TRSDOS	\$250	G/L for schools	Bonus pay feature
Charles Mann & Assoc. 55722 Santa Fe Trail Yucca Valley, CA 92284	Apple II	Apple DOS	\$119-\$139	G/L, A/R, A/P, Job Cost	—
Compumax Inc. Box 7239 Menlo Park, CA 94025	48K, 2 disks on Apple II Atari 800, IBM PC, NEC, Osborne 1, TRS-80	varies depending on version: CP/M, MP/M, CP/M-86, Unix, Oasis, PLDOS	\$200—Atari 800 \$140—for other versions	G/L, A/R, A/P	W-2's full one-year warranty
Computer Consultants 312 Hoyt Street Dunkirk, NY 14048	Radio Shack TRS-80 Model III, 48K, 2 disks	LDOS	\$695 includes 2 years support package	G/L, A/R, A/P	vacation pay, sick pay, tips, commission, bonus, city & local tax, time card labels
Computer Mart Inc. 3275 E. Platter Ave., #E Colorado Springs, CO 80909	Pertec, Rexon, Micro- Five, Mercator	MTX, Recap, Bus Basic	\$2,500 (end-user)	G/L, A/R, A/P, Job cost, Fixed asset	1099's, W-2's, restaurant payroll, payroll w/Job cost
Computerware 4403 Manchester Ave., Ste. 103 Encinitas, CA 92024	Smoke Signal, SWTPC Gimix	DOS, Flex, OS-9	\$695	G/L, A/R, A/P	prints W-2 forms
Continental Software 11223 S. Hindry Ave. Los Angeles, CA 90045	Apple II & III & 48K Applesoft ROM, 2 drives, printer (132 columns)	DOS 3.3	\$250	G/L, A/R, A/P	prints payroll journal; flexible employee file; maintenance section
Cybernetics 8041 Newman Ave., #208 Huntington Beach, CA 92647	wide variety of 8-, 16-bit microcomputers	CP/M, MP/M, CP/M-86, Unix, PLDOS, Oasis	\$1000 + \$150-media charge for source	G/L, A/R, A/P	wide variety of special earnings deductions, payroll worksheet for gathering input data, G/L distribution report interfaces to G/L
D.B. Software Services Int'l., 11840 N.E. Brazee Portland, OR 97220	TRS-80 IBM (PC) w/disk drive	TRSDOS, DOS Plus, IBM DOS	\$75-\$150	G/L, A/R, A/P, Job cost	—
Data Automation Services Int'l., 2145 N.W. 10th Street Gainesville, FL 32601	TRS-80 II w/expansion drive or hard disk	TRSDOS	\$750	G/L, A/R, A/P, Job cost	maintains sicktime and vacation time taken
Data Smith P.O. Box 8036 Shawnee Mission, KS 66208	most 48K, dual disk system w/80 column terminals	CP/M, IBM PC DOS, Micropolis MDOS	\$400	G/L	—
Great Plains Software 123 N. 15th Street Fargo, ND 58102	any UCSD Pascal system with 64K memory, Apple II or II w/profile or Corvus	UCSD Pascal (2.1)	n/a	G/L, A/R, A/P	comprehensive error trapping
High Technology Software Products Inc. 2201 N.E. 63rd Street Oklahoma City, OK 73113	48K Apple II with at least one floppy; up to 8 floppy drives	Applesoft and Apple DOS	\$295	—	extensive error trapping
Micro Architect Inc., 96 Dothan Street, Arlington, MA 02174	Radio Shack II, IBM PC, Xerox	TRSDOS 2.0A, IBM PC, CP/M 2.2	\$129-\$248	G/L, A/R	local, tax, source code, W-2's, tax tables

y = yes n = no n/a — information not available

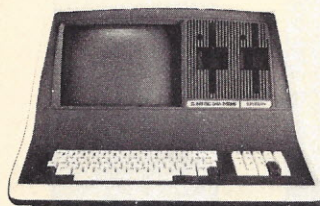
Chart 1. Company and configuration data (continued)

Company	Hardware	Operating System	Price	Other Programs in Series	Comments
Micro Mikes Inc. 3015 Plains Amarillo, TX 79102	North Star Horizon min. 48K; minimum two double density 5.25-in.	North Star and CP/M Basic	\$750 (software)	G/L	can recall last check paid to employee w/ a single keystroke.
Occupational Computing Co. 1536 E. Katella Anaheim, CA 92805	TRS-80 Model I, II, III, Xerox 820 w/64K	TRSDOS, CP/M	\$350-\$495	G/L, A/R, A/P, Job cost, Fixed assets	labor distribution, union reporting, loan deductions, automatic employer deposit check, prints W-2 forms
Omni Software 146 North Broad St. Griffith, IN 46319	North Star Horizon or Advantage	North Star DOS	\$495	G/L, A/R, A/P, Job cost, Fixed assets	—
Open Systems Inc., 430 Oak Grove, #409 Minneapolis, MN 55403	any systems w/64K and two 8-in. drive min.	CP/M, CP/M, Oasis COS990, others	—	G/L, A/R, A/P, Job cost	—
Peachtree Software, 3 Corporate Sq., Ste. 700 Atlanta, GA 30329	Z80, 8080, CPU/w 50K TPA, 320K disk space	CP/M 2.0+	\$750	G/L, A/R, A/P	handles disbursed/nondisbursed misc., income, user receives a tax file for all 50 states, update service
Potters Programs 25929 Gratiot Roseville, MI 48066	North Star	North Star DOS	\$60	—	simple-to-use; prints out any field.
Relational Systems, 5002 Commercial St. S.E. Salem, OR 97306	Z80, 8080 56K	CP/M	\$395	G/L	—
SMC Proprietary Systems 101 Route 22, P.O. Box 6800 Bridgewater, NJ 08807	Rexon, Pertec, Onyx, Mercator and others	Boss, RPS, Unix	available on request	G/L	—
Software Technology for Computers Box 428 Belmont, MA 02178	Apple II, Apple III emulation	Applesoft MDOS (IBM)	\$275	G/L, A/R, A/P, Job cost	ability to update payroll in beginning or anytime through the year, sort or search employee history file, YTD & current payroll report
Structured Systems Group Inc. 5204 Claremont Ave., Oakland, CA 94618	8080, 8085, 8086, Z80	CP/M, MP/M	n/a	G/L, A/R, A/P, O/E, Fixed assets	—
Systems Plus 1120 San Antonio Palo Alto, CA 94303	any 8080, 8085 or Z80 processor operating under 2.0 CP/M or MP/M. 56K RAM with CP/M 48K RAM with MP/M; two disk drives.	CP/M, MP/M	n/a	G/L	labor distribution reports, single check generation
TCS Software Inc. 3209 Fondren Rd. Houston, TX 77063	8080, Z80, 8085, 8086, 8088	CP/M	—	G/L	—
TLB Associates Inc. Box 414 Findlay, OH 45840	Z80 with 64K and two 8-in. double density drives	CP/M	\$3,495	G/L, A/R, A/P, Job cost, Fixed assets	Complete package built around DBMS. Transactions are automatically updated, verified and balanced.
Technology Systems Inc. 2 Girsworld St., Bethel, CT 06801	North Star Horizon, Advantage, CP/M, Z80, 8080 machines	North Star DOS, CP/M	\$500	G/L, A/R, A/P, Job cost	—
Vandata 17544 Micvale Ave. N., Ste. 205 Seattle, WA 98133	most CP/M systems	CP/M	\$295	G/L, A/R, A/P, Job cost	Overhead distribution by %
Westware 244 S.W. 4th Ave., #2 Ontario, OR 97914	Apple II Plus, Apple III, Corvus compatible 48K, 2 disk drives	Apple DOS	5 or 10 Corvus—\$595	G/L, A/R, A/P, Job cost Fixed assets	automatically prints W-2's

y = yes n = no n/a — information not available

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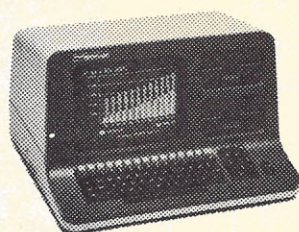
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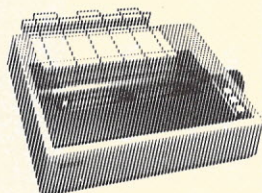
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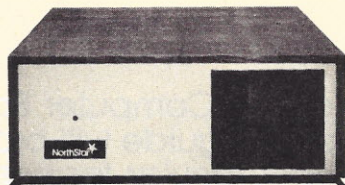
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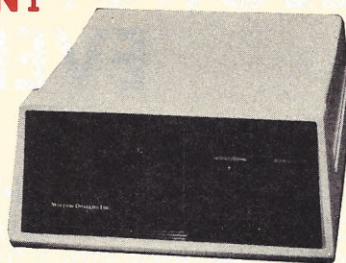
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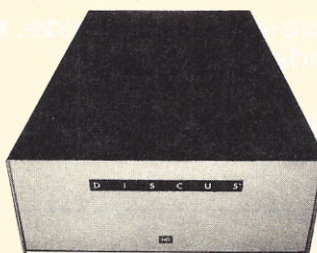
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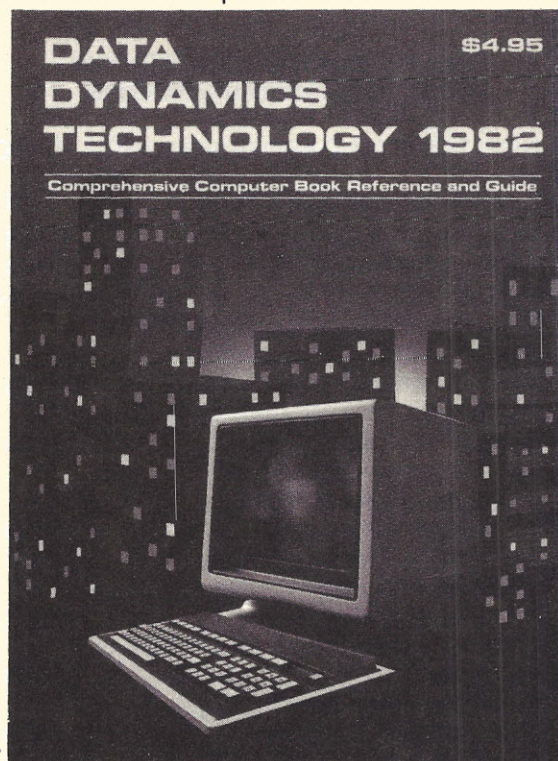
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Guide to Chart 2 questions

- 1) **Links to Other Programs**—Can the payroll system update other programs such as general ledger automatically? (For example, the Peachtree series of programs includes a "transfer file.")
- 2) **Calculates Deductions**—Does the program calculate deductions from payroll, such as FICA, Federal and State withholding, or must these items be entered by the user for each payroll check?
- 3) **FICA, SDI Tables Changeable**—Can the user change the rates the program uses for Social Security (FICA) and State Disability Insurance?
- 4) **Withholding tables Changeable**—Can the user change the withholding tables for Federal and State income tax withholding?
- 5) **Accommodates More than one State**—Can the program include employees taxed under more than one state? The payroll for that company would have to be able to accommodate State 1's income tax deduction and State 2's income tax withholding.
- 6) **Calculates Payroll based upon...**—How is payroll calculated? Does the user enter hours (H), salary (S), units (U) or flat rate (F)?
- 7) **Payroll Period**—What is the standard period used to calculate payroll? Options: weekly (W), bi-weekly (B), monthly (M), user-selected (U).
- 8) **Overtime**—How is overtime handled by the system? Does the system calculate overtime automatically (in other words, if 50 hours are entered for a week, 10 are calculated at overtime), or is it semi-automatic (in other words, the user specifies overtime hours, and overtime is calculated based upon that)?
- 9) **Hourly Wage and dollar amount on same payroll**—Can the system accommodate different pay types on the same payroll? In other words, could one employee be paid a flat salary and another be paid by the hour on the same payroll?
- 10) **Number of Earnings Categories**—How many types of earnings can be differentiated? For example, can regular, overtime and vacation pay be differentiated?
- 11) **Number of Deductions Categories**
- 12) **Deduct Categories have description**—Do the deductions categories contain descriptions—particularly the miscellaneous deductions? Do the summaries of the payrolls contain summaries of the deductions by type—especially the miscellaneous deductions?
- 13) **Number of Departments**—If the system has the capability for departmental reporting, indicate the number of departments it can handle. Note that departmental accounting is **different from job costing**.
- 14) **Distribute to more than one department**—Does the system allow the user to allocate wages for an employee to more than one department? For example, could 20% of the wage be applied to department A, and 40% to B, with the remainder allocated to department C?
- 15) **Change departments easily**—Can an employee's departmental allocation be changed with ease?
- 16) **Job Costing**—Does the system allow job costing in addition to departmental allocation? Job costing is separate and distinct from departmental allocation—and this is an important consideration from an accounting standpoint.
- 17) **How many Jobs**—This question seeks to identify how many jobs can be kept on the system simultaneously.
- 18) **Job Cost by Job Report**—Does the system provide the user with an accounting of time by job? This report should be produced on a periodic basis—in other words, not just by payroll period. To look at it in another fashion, does the system accumulate information on a job-by-job basis and retain that information for more than one payroll period?
- 19) **Hours as well as dollar amount of Departments & Jobs**—Does the system maintain information on a departmental and/or job center basis for statistical basis—are hours kept? Generally, these kinds of reports will include dollars of labor cost and the corresponding hours.
- 20) **Earned Income Credits**—Does the system include information about earned income credits? This Federal program results in a lowered Federal withholding for some employees.
- 21) **Calculate FUI (Federal Unemployment Insurance)**—An employer is assessed tax based upon a percentage of employees' wages up to a certain amount. Does the system provide, in any reporting capacity, a report that informs the user of FUI liability, or wages subject to FUI reporting? (Note that FUI has nothing to do with FICA deductions.)
- 22) **Check Writer**—Does the system produce employees' checks?
- 23) **Accommodate Hand Checks**—Sometimes, for various reasons, an employee must be paid before a regularly scheduled payroll period. Does the system allow the user to enter information regarding any hand-checks?
- 24) **Prepare 941/State Quarterly**—Does the system prepare the summaries of payroll necessary to prepare the Federal and State payroll tax forms? Such summaries should include wages for the quarter, FICA wages, withholding information, and information on wages subject to state disability insurance taxes.
- 25) **Union Reports**—Many industries, particularly the construction trade, must prepare monthly union reports that include wage information on all union employees, by union. Does the system have the capability to prepare such reports?
- 26) **Overtime Summary**—Does the system include the capability to summarize overtime wages for the payroll period?
- 27) **Standard Recurring Deductions**—Can the system make standard recurring deductions, such as health insurance, etc. without having to input the deduction for each payroll?
- 28) **Earnings History**—Does the system maintain an earnings history for each employee? This history should encompass the calendar year-to-date, and will be necessary for the preparation of W-2 forms.
- 29) **Dates in Employee File**—Does the system maintain information about the employee, such as hire date (H), review date (R), termination date (T)?
- 30) **Capacity**—How many employees may be accommodated on the system? In the case of systems that are entirely disk space-dependent, is the typical number that may be maintained on an average user's equipment?

Chart 2. Payroll program features

Company	1) Links to other programs	2) Calculates deductions	3) FICA, SDI tables changeable	4) Withholding tax tables changeable	5) Accommodates more than one state	6) Calculates payroll based upon...	7) Payroll period	8) Overtime calculation	9) Hourly & Dollar in same payroll	10) Number of earnings categories	11) Number of deductions categories	12) Descriptions for deductions categories	13) Number of departments possible	14) Can user distribute wages to more than 1 dept.
Advanced Data Systems	y	y	y	y	y	H,S	W,B,M,U	auto	y	no limit	8	y	no limit	y
BPI Systems	n	y	y	n	y	H,S,U,F	W,B,M,U	auto	y	6	9	y	10	y
Broderbund Software Inc.	y	y	y	n	y	H,S,U,F	W,B,M,U	auto	y	5	30	y	15	n
Business Microproducts	y	y	y	y	n	H,S	W,B,M,U	semi	y	2	8	y	n/a	n/a
Charles Mann & Associates	y	y	y	y	y	H,S,U,F	W,B,M,U	semi	y	10	10	y	300	y
Compumax Inc.	y	y	y	y	n	H,S	W,B	semi	y	reg & special rate	5	y	0	n
Computer Consultants	y	y	y	y	n	H,S,U	U	auto	y	8	9	y	1	n
Computer Mart Inc.	y	y	y	y	y	H,S draws comm.	W,B,M,U	auto	y	variable	variable	user-defined	99	y
Computerware	y	y	y	y	y	H,S,F	W,B,M,U	semi	y	3	2	n	unlimited	y
Continental Software	y	y	y	y	y	H,S	W,B,M	auto	y	6	5	y	infinite	n
Cybernetics	y	y	y	y	y	H,S,U,F bonus comm. tips, misc.	W,B,M,U	auto	y	71,000 if desired	71,000 if desired	y	999	y
D.B. Software Services Int'l.	y	y	y	y	y	H,S,U,F	N,B,M,U	auto	y	3	6	y	1	n
Data Automation Services Int'l.	y	y	y	y	y	H,S,U,F	N,B,M,U	semi	y	4	up to 22	y	99	up to 140
Data Smith	n	y	y	y	y	H,S,F	W,B,M,U,S	semi	y	4	5	y	10	n
Great Plains Software	y	y	y	y	y	H,S,U,F	W,B,M,U	both	y	20	up to 999	y	999	y
High Technology Software	n	y	y	y	y	H,S,U,F	W,B,M,U	semi	y	7	10	y	100	n/a
Micro Architect Inc.	y	y	y	y	y	H,S,F	W,B,M,U	semi	y	3	7	y	999 at least	n
Micro Mikes Inc.	y	y	y	y	y	H,S	W,B,M	semi	y	5	4	20-character description	9 can be adapted for more	n
Occupational Computing Co.	y	y	y	y	y	H,S,U,F	W,B,M,U	auto	y	12	no limit	y	no limit	y
Omni Software	n	y	y	y	n	H,S,U,F	W,B,M	auto	y	6	4	y	1	n
Open Systems Inc.	y	y	y	y	y	H,S	W,B,M,U	semi	y	8	11	y	unlimited	y
Peachtree Software	y	y	y	y	y	H,S	W,B,M semi-man.	semi	y	11	12	y	99	n
Potters Programs	n	y	y	y	n	H,S	U	auto	y	1	5	y	9	n
Relational Systems	y	y	y	y	y	H,S,U,F	W,B,M,U	auto	y	4	3	describes each one	n	n
SMC Proprietary Systems	y	y	y	y	y	H,S	W,B,M	auto	y	9	11	n	disk	n
Software Technology	y	y	n	n	n	H,S,U,F	W,B	semi	y	5	5	3	125	n
Structured Systems Group Inc.	y	y	y	y	y, state wide tables	H,U,F	W,B,M,U	auto	y	multiple	multiple	multiple	multiple	y
Systems Plus	y	y	y	y	y	H	W,B,M,U	auto	y	4	10	y	—	n
TCS Software Inc.	y	y	y	y	y	H,S	W,B,M,U	auto	y	5	7	y	999	y
TLB Associates Inc.	y	y	y	y	n	H,S	W,B,M + semi-man.	semi	y	3	8	n	disk	n
Technology Systems Inc.	y	y	y	y	y	H,S,U,F	W,B,M	auto manual	y	1	4	y	disk	n
Vadata	n	y	y	y	n	H,S,U,F	W,B,M,U	auto	y	7	unlimited	y	99	y
Westware	y	y	y	y	y	H,S,U,F	W,B,M,U	semi	y	6	3	y	n	n

y = yes n = no n/a — information not available

15) Change depts. easily	16) Job costing in addition to depts.	17) How many jobs can be on system	18) Job cost by job report produced	19) Hours & \$ on job cost report	20) Does payroll program handle earned income credits	21) Is F.U.I. calculated	22) Does system write checks	23) Does it accommodate hand checks	24) Is form 941 prepared	25) Is union report prepared	26) O.T. summary by period	27) Are standard recurring deductions made	28) Earnings history	29) Dates in employee file	30) Capacity number of employees
y	y	no limit	y	y	n	y	y	y	y	y	y	y	y	H,T	no limit
y	y	100	y	y	y	n	y	y	y	n	n	y	n	H,R,T	100 employee/disk
y	n	n/a	n/a	n	n	n	y	y	y	n	y	y	y	n	300
n/a	n	n/a	n/a	n/a	n	n	y	y	y	n	y	y	y	H,T	160+
y	y	350	y	y	n	y	y	y	y	n	n	y	y	C/H,R,T	300 max
n	y	5/person	in some version	n	n	n	y	—	y	n	n	n	y	H,R,T	min. 200; depends on hardware
n	n	n/a	n/a	n/a	y	n	y	y	y	n	y	y	y	H,T	100-300; depends on disk space (avg. 200)
y	y	999	y	y	y	y	y	y	y	y	y	y	y	H,T	150 (1.2M byte) 1,000 on 10M byte
y	y	unlimited	y	y	n	y	y	y	y	y	n	y	y	H,T	unlimited
y	n	—	—	—	n	y	y	y	y	n	n	y	y	H,T	50 if paid weekly 100 if bi-weekly
y	n	costing via profit centers	n/a	y	y	y	y	y	y	y	y	y	y	H,R,T	depends on disk capacity
n	n	limited by disk space	y	y	n	n	y	y	y	n	n	y	y	H	std. M III system 100; larger w/increased disk space
n	y	unlimited	y	n/a	n	y	y	y	y	y	y	y	y	H,T	up to 1,500
y	y	—	—	y	y	y	y	—	y	n	n	y	y	H,T	150/100 disk storage
y	n	0	y	y	y	y	y	n	y	y	y	y	y	H,T	up to 999
y	n/a	n/a	n/a	n/a	y	y	y	y	y	y	y	y	y	H,R,T	400+
y	n	n/a	n/a	n/a	n	n	y	y	y	n	n	y	y	H,T	depends on hardware
n	y	depends on disk space	y	y	n	n	y	y	y	y	y	y	y	n	200 on double density disks
y	y	no limit	y	y	n	y	y	y	y	y	y	y	y	H,R,T	Hard disk—4,000 floppy disk—500 100 employees/disk
n	y	99	y	y	y	y	y	y	y	y	y	y	y	H,T	400
y	y	unlimited	y	y	y	y	y	y	y	n	y	y	y	H,T	unlimited
n/a	n	n/a	n/a	n/a	y	y	y	y	y	n	y	y	y	H,T	disk-based
y	n	—	—	—	n	n	y	y	n	n	n	y	y	H,T	400+
n	n	n	n	n	n	n	y	y	y	n	y	y	y	n	n/a
y	n	n/a	n	n	y	y	y	y	y	n	n	y	y	H,T	system-dependent
y	n	—	n	y	n	y	y	y	y	y	y	y	y	H,R,T	125
y	y	multiple	y	y	y	y	y	y	y	y	y	y	y	user-defined H,R,T	limited only by disk space
n	n	n/a	n/a	n/a	y	n	y	n	y	n	n	y	y	n	65,000
y	n	n/a	n/a	n/a	n	y	y	y	y	n	y	y	y	H,T	500
y	y	disk	y	y	n	y	y	y	y	n	y	y	y	H,T	disk
y	y	disk	y	y	n	y	y	y	y	y	n	y	y	n	9,000
y	y	999,999	y	y	n	n	y	y	y	n	y	y	y	H	999
y	y	300	y	y	y	y	y	n	y	n	y	y	y	H,T	100/diskette

Voice Input/Output Continued from page 81

While speech produced by formant synthesis can generate unlimited vocabularies, intelligibility is a key issue. Formant synthesis has been described as sounding like the Swedish Chef on the Muppet Show or a berserk auctioneer barking through a pipe. It does take some getting used to. Once mastered, however, users of talking terminals are comfortable cruising along at 300 to 400 words per minute (compared to 100 to 150 words per minute for normal speech). Advances in hardware and software are improving the intelligibility of formant synthesis; in a few years, it is expected to be nearly equivalent to human speech.

The blind and visually impaired figure prominently in the development of a device by the Exit-Us Corporation (Easton, CT). Exit-Us manufactures a talking exit sign designed to help the vision-impaired cope with emergency situations. When activated by a sensor, switch closure or central alarm system, the sign speaks one of several safety messages including "Attention...Fire...Exit this door" and "Power failure...Remain calm" In the event of a dual crisis, the sign's internal logic restricts the announcement to the highest priority message. When paired with

a heat sensor on the opposite side of a door, the sign can warn that the exit is not safe. Since a strictly limited vocabulary was required, Exit-Us chose synthesis by waveform digitization with compression. Since this type of synthesis begins with words actually spoken by a human, the sign speaks in a calm, informative and readily understandable voice, offering positive psychological impact. Exit-Us has installed signs in hospitals, convalescent homes, schools and facilities for the blind.

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KS). The system combines voice synthesis, video monitors and extension telephones into an economical, effective and quiet paging system. Doctors interact with the system through any hospital telephone. Upon arrival, the doctor contacts the system, dials his identification code and dials "5", indicating he is in. The system's synthesizer verifies his status by saying "in" and the doctor's last name, initials and specialty are displayed in alphabetical order on video monitors. The monitors are placed in strategic locations so that the telephone operator and other key hospital personnel have access to the information.

Messages, in the form of an extension number to call, are placed into the system by the operator. Also, those authorized for direct access to the system may store messages through keypad codes. When the physician registers in or out—or at any other time desired—the pending messages are read out from memory and spoken over the phone by the synthesizer. Messages may be repeated, allowed to remain in storage or be automatically erased without additional physician activity. With expansion equipment, messages may be received from outside the hospital using any touch-tone telephone.

The Quintrex system is an S-100-based computer with floppy disks for mass storage. Since memory size was not a constraint, Quintrex chose to use CVSD coding (see sidebar) for its synthesizer. In addition to achieving high quality synthesis, the firm is able to easily create custom messages when needed.

Automated appointment reminder

R. S. Lankford, M.D., an Iowa physician, decided to apply voice synthesis to a productivity problem in his own office. It was not uncommon to have 10 to 20 missed appointments per week. Attempts to remind patients by telephoning during office hours were unsatisfactory because few could be reached in the daytime.

The office had been using an Apple computer to manage its appointment schedules. This was augmented with a speech synthesizer and auto-dial modem. The system now calls patients the night before their appointments to remind them of their appointment time on the following day. The auto-dial hardware of the modem is used to read the text files of the scheduling program and dial the phone numbers. The modem function is then interrupted to allow the synthesizer to deliver the message. The message is repeated twice to increase comprehension. Patients are also told to call the office at 9:00 A.M. if they cannot keep their appointment. This opens up time spaces that can be utilized for acute illnesses.

Experimentation indicated that calls between 8:00 and 9:00 P.M. were most effective, so the call-

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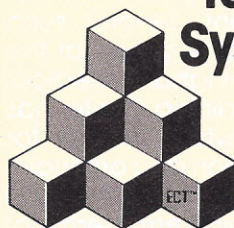
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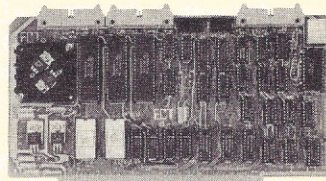
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out program monitors the computer's clock and begins its job at 8:00. Patients are made aware of the system in an information booklet given to all new patients. While first calls are occasionally misinterpreted as "obscene" by some patients, the response is largely positive. In conjunction with a nominal penalty fee instituted at the same time as the reminder call, the synthesis solution has reduced missed appointments to less than five per week.

Speaking In

Like voice output, input using speech recognition technology is a useful tool. However, speech recognition provides a different range of capabilities that utilize the voice communication channel for data input and control. Speech recognition involves digital analysis of the utterance waveforms. After determining the starting and ending boundaries of a spoken word, the signal is dissected into frequencies, amplitudes and voiced and unvoiced sounds. The resulting digital representation is then compared with the stored patterns that comprise the device's recognition vocabulary. If a match occurs, the recognizer responds with some action, typically by transmitting a character string (selected by the user) to a host computer.

Support for the disabled

There are about 200,000 paraplegics in the United States. By combining speech recognizer, microcomputer and various peripherals, it is possible for a paraplegic to have greater control of the surrounding environment. Several such systems have been constructed. A group at the University of Alabama at Birmingham Medical Rehabilitation, Research and Training Center has been developing the C2E2, which stands for communication, control, education and entertainment. The system is built around an Apple II computer with a Shadow/VET voice entry terminal manufactured by Scott Instruments (Denton, TX). The C2E2 is totally voice-controlled once it has been powered up and the user is not required to touch the keyboard.

A master control menu is used to select, by voice, one of several functions to be performed by the system. When a choice has been made, the user is led through the selection of various options. At each point, the appropriate recognition vocabulary is automatically loaded. One essential function is provided by the C2E2 is telephone control. With voice direction, the user may answer, dial and disconnect the phone. Frequently-used telephone numbers may be stored on disk. A power control option is available that utilizes BSR X10 and Mountain Computer (Scotts Valley, CA) interfaces. These can be used to control lamps, appliances, door locks and other devices.

A television controller is under development that will allow the user to turn a set on and off, adjust the volume and change channels. A text writer/editor for the system is nearing completion. Words are entered by spelling them and voice commands allow the text to be manipulated. The group plans to add a synthesizer and amplifier so that music may be generated. Nearly all the software available for the Apple can be run under voice control.

Gene Spalding of Columbus, GA, was paralyzed in a swimming accident in 1979. After enrolling in the Georgia Computer Programmer Project for the Severely Handicapped, Spalding built a system of his own design around the Apple II and Scott Instruments recognizer. With assistance from his system, he runs a dealership for Commodore computers and works as a computer consultant.

Rick Pilgrim, another paraplegic, studied a couple of programming languages and received practical training with a speech recognizer under the auspices of the Vocational Rehabilitation Department in Virginia. By circulating his resume, he landed a job as part-time programmer with the National Institutes of Health. Pilgrim uses voice entry equipment manufactured by Interstate Electronics (Anaheim, CA) and a local minicomputer to write programs for NIH's clinical data management system. After verifying his input on a CRT or printout, the programs are sent by telephone line to NIH's central computers in Bethesda, MD.

A particularly impressive voice-controlled system is being constructed by Robert Marince, who was paralyzed about five years ago. With help from his brother Gary, Marince is also building his system using the Apple/Scott combination. Basic operations include control over telephone, television, lights, room temperature, and stereo, and he can raise and lower his bed. The system also includes a speech synthesizer allowing him to receive replies and confirmations of his voice instructions without looking at the monitor.

So that Robert can acquire university credits, Gary Marince has installed a 12-foot satellite dish antenna to receive over 20 educational channels. Robert has voice control over a video tape recorder so that he can record and review lessons. When reviewing materials, he dictates notes to the system and produces hard copy on a printer. At present, the satellite dish must be positioned manually, but the brothers plan to automate that task and interface it as well.

Better control of the surgical environment

Speech recognition technology is also being put to use in the operating room. Ophthalmic surgeons, in the course of doing delicate microsurgery on the eye, frequently view their working area and surgical instruments through a microscope. Microscope

positioning, focus and lighting, as well as room lighting, are critical in an operation. Traditionally, the microscope has been controlled by the surgeon through foot switches. Aside from requiring the surgeon to operate with shoes off, the foot switches can get misplaced, causing lost time while they are located. Room lighting, controlled by a wall switch, requires a circulating nurse to grope for the switch in the dark when the surgeon requests the lights on.

Dr. Jay Fleischman, a Director of the Bethesda Eye Institute and Associate Professor of Ophthalmology at St. Louis University School of Medicine, felt there had to be a better way to control this surgical environment. Calling upon his knowledge of computers and electronics, he created a voice-controlled system. Fleischman's system is based on a voice recognizer made by Heuristics Incorporated (now defunct) and an Apple computer with two floppy disk drives. Interfacing is by relays and a BSR X10 controller and modules. The system frees limbs from operation of microscope zoom, focus, lights and x-y translation. By also controlling the room lights, one less nurse is needed during surgery. A recognizer manufacturer and a microscope

maker are working with Fleischman to commercialize the design.

Opportunities for new medical applications

While the medical field is taking a lead in putting speech synthesis and recognition to use, there remain dozens of potential medical applications.

Emergency equipment: When seconds are critical, emergency personnel must concentrate very directly on the patient. Time is lost when a doctor, nurse or paramedic must divert attention to read an instrument. Speech synthesis can be used to announce pulse and respiration rates and other monitored values. Synthesis can also be used to guide people through complex or critical procedures or those with which they are not intimately familiar. Solid state speech techniques provide constant readiness and have no moving parts that could fail at the wrong time.

Patient monitoring: Voice output can provide detailed information very quickly on patients being monitored in intensive care units: patient's name, location, nature of problem, urgency. Voice is able to be more descriptive than other types of alarms. By coupling to the telephone



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system, others outside the area, such as the patient's doctor, can be instantly notified when a problem arises. A doctor could also call in, identify himself and his patient by touch-tone input and receive an up-to-the-minute report without disturbing nursing personnel.

Training devices: Computer controlled simulators can duplicate a variety of medical situations. With speech synthesis and recognition, training sessions for medical personnel can be made even more realistic.

Robotic arms: The voice controlled systems for paraplegics described above still leave them heavily dependent on other people for such simple tasks as eating, drinking or reading a magazine. The use of speech recognition to program and control robotic arms will help overcome these difficulties. A wheelchair equipped with one or two robotic arms and controlled by voice could represent more independence for a paraplegic.

Patient admitting: Getting a patient into a hospital requires a lot of questions, answers, writing

Sorting Out Synthesis

Many techniques are available for electronically generating synthetic speech. Each variation has advantages and disadvantages that strongly influence the choice of method for a given application. Synthesis techniques can be divided into four general categories.

Waveform Digitization—A speech waveform is a complex collection of frequencies and amplitudes. These can be converted to digital form by conventional analog-to-digital techniques and stored in memory or on disk. The stored speech is output by passing the digital data through a digital-to-analog converter and then to the listener. A related technique, called continuously variable slope delta (CVSD) modulation is more widely used than direct A/D conversion. This technique makes use of the fact that the speech waveform is always changing and is either more positive or more negative than it was in the last sampling period. CVSD encoding produces a serial bit stream that may be stored. Speech production reverses the process. Waveform digitization techniques produce good quality speech at about 16,000 bits per second and above. Lower rates sacrifice fidelity and intelligibility—the practical lower limit of rate is about 9,000 bps.

Waveform Digitization with Compression—The number of bits required to encode speech can be substantially reduced by analyzing and optimizing the data. Digital data compression algorithms—applied manually or by using automated methods—reduce storage requirements to a tenth of that needed for straight waveform digitization. Intelligible speech is produced from data at 1,000 to 2,000 bits-per-second, allowing economical storage in solid state memory.

Linear Predictive Coding—LPC is a means of mathematically and electronically modelling human speech. A digital filter, controlled by coded vocal tract parameters, processes the output of random and periodic sources. The speech in a small time period is anticipated from a combination of previous samples and the digital filter coefficient,

thus the term "linear prediction." In digital form, the data consists of information about pitch, amplitude, voicing and filter coefficients. LPC also reproduces speech at about 1,000-2,000 bps.

Formant Synthesis—Speech can be broken down into very small fundamental units that derive from the physics and linguistics of the speech process. Phonemes and allophones are such units. Formant synthesis provides the selection of language units, which are concatenated to form words. Combinations of about 60 phonemes can be used to create any word in the English language. Plain text is the usual input to a formant synthesizer. The text is analyzed and formants are strung together according to a set of linguistic and grammatical rules (hence the alternate name, synthesis by rule). Formant synthesizers are often described as having unlimited vocabularies, but in practice their pronunciations are less than perfect.

The accompanying table summarizes the key characteristics of the various synthesis techniques. Tradeoffs in selecting a synthesis technology (aside from cost) center around quality, vocabulary size and available memory.

Technique	Data Rate, bits per second	Relative Memory Requirements	Speech Quality	Vocabulary
Waveform Digitization and CVSD	12K-16K and up	large	excellent	fixed (but can be changed in field if hardware permits)
Waveform Digitization with Compression	1K-2K	moderate	good	fixed
LPC	1K-2K	moderate	good	fixed
Formant Synthesis	70-100	small	fair	unlimited

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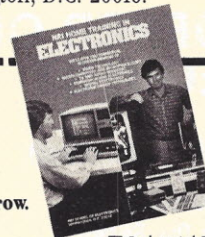


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and typing. Much of this could be eliminated by judicious use of the natural voice communication channel between patient and computer.

Laboratory and pharmacy assistance: Speech recognition can be used to record data while looking through a microscope or performing other tasks. Voice control of instruments and testing sequences is another possibility. Pharmacy personnel write many quantities and patient numbers—a task that could be easily eliminated by voice input.

Routine report generation: Many physicians, especially radiologists, must produce numerous relatively routine reports each day by writing or dictating. Voice recognition, assisted by context generating software, could accept key words, expand them into sentences and print out reports at high speed. Not only would the reports be readable, but could be prepared with minimal overhead. □

William W. Creitz has been designing and developing micro-based equipment since 1975. He serves as chief engineer for a computer graphics peripheral manufacturer in Rockville, MD.

Speech Technology Literature

Following are general sources of information about speech synthesis and speech recognition:

VoiceNews—a newsletter on current happenings in the voice technology field; published 10 times per year. Stoneridge Technical Services, Box 1891, Rockville, MD 20850.

Speech Technology—a quarterly magazine with general and technical articles on synthesis and recognition. Media Dimensions, 525 E. 82nd St., New York, NY 10028.

Teaching your Computer to Talk by Edward Teja—a basic introduction to both recognition and synthesis. Tab Books, Blue Ridge Summit, PA 17214.

Voice Output and Voice Input Technology—a video tape describing a talking terminal developed by NIH; illustrates Rick Pilgrim's voice recognition system (described in the accompanying article). Div. of Computer Research and Technology, Information Office, Bldg. 12A, Room 3027, National Institutes of Health, 9000 Rockville Pike, Bethesda, MD 20205.

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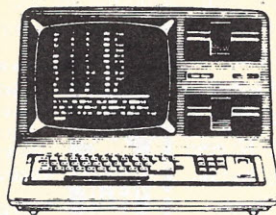
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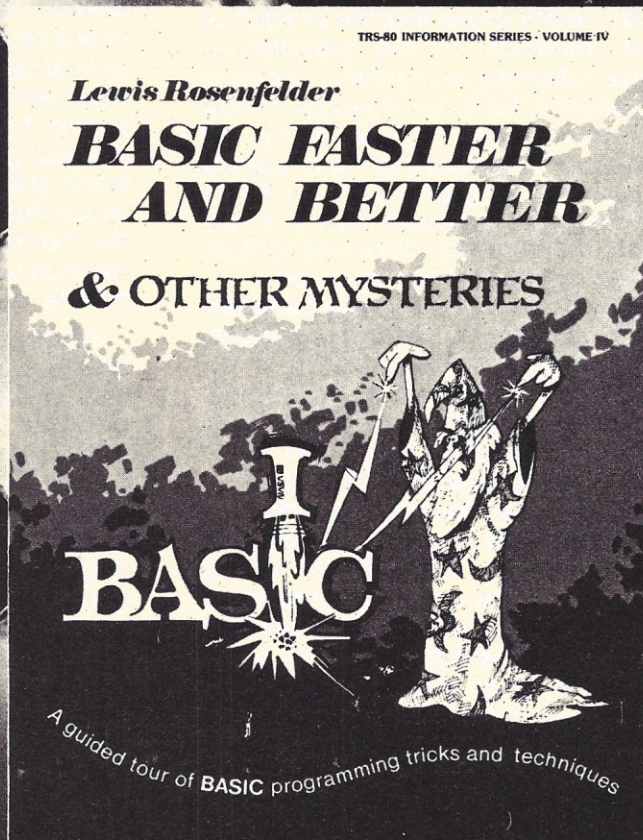
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Physician's Office Lab

Continued from page 83

specimens, with the proposed new methodology and subjecting the results to standard statistical analysis. Significantly, the micro has made this once formidable task readily available—even to the statistically naive.

One of the most significant developments in laboratory medicine in the past few years has been the revival of Bayesian Statistics for the evaluation of the actual predictive value of a positive or negative test. We often use a test result to predict the presence or absence of disease. The Bayesian Statistic clearly shows that the predictive value of a test depends on the prevalence/absence of a given disease or condition; many of our most time-honored tests for diseases of low prevalence may have a very high sensitivity, but are actually very poor at predicting the presence or absence of disease. Programs such as BAYES have been developed to evaluate tests in a very easily-understood manner that does not require actual knowledge of the statistics involved.

Many drugs have a very narrow range between the effective and toxic levels. Recent developments in measuring very small quantities of drugs in the serum (radioimmunoassay, enzyme coupled assay, etc.) have made therapeutic drug monitoring possible even in the smaller-scale clinic lab. Even when specimens are sent out to a reference facility, the clinic lab can calculate the ideal adjusted dosage to maintain effective levels. The calculations are very involved and consider the partition of the drug (volume distribution) as well as the individual metabolic rate. Programs such as TDM, which is based on a model for Gentamycin, can easily bring patient-specific drug dosage out of the research hospital and into the office of the private physician. In addition to actual serum drug measurement and calculation, it is widely recognized that body surface area is certainly better correlated with effective dosage than body weight—particularly in the pediatric age group. This is readily calculated by the micro.

Housekeeping

The computer is pre-eminent as a list keeper and, as such, performs invaluable service in the larger laboratory. The once laborious and error-prone tasks of inventory, scheduling phlebotomy rounds, equipment maintenance, sample analysis ordering and a hundred others have been relieved. The supervisor is now able to actually spend some time supervising. With a low volume of testing, it is far easier to keep inventory either inside the natural computer the chief technician was born with or a simple card system. Then the proper sequential scheduling of tests is not a problem.

An example of the functions of the micro as list-keeper is Bacterial antibiotic sensitivity. We are

increasingly faced with the problem of antibiotic-resistant strains of bacteria. Unfortunately, the patterns of resistance change with time and differ with areas of the country and the specific patient mix. With experience, we develop a feeling for these patterns and tend to prescribe a certain antibiotic for a given type of infection. Since the infection is urgent, the usual procedure is to take a culture and start an antibiotic, then wait 24 hours for the speciation and another 24 hours for the sensitivities. If they come back as insensitive to the drug used, we then switch. If we stop the previous drug after only two days, this is a good way to ensure a viable drug-resistant strain. We could use almost any of the commercial database/file management systems or any of the financial spreadsheets to make the antibiotic choice on more rational ground. Each site or type of infection and each species of bacteria becomes a record in which the fields are antibiotics and the contents of the fields is yes/no. It is simple to update these records with each report and have an up-to-the-minute "probability of sensitivity" report.

Initially, the database can be queried as to site/type and a probable species for patient-mix and probable sensitivity can be acquired. The next day, after a phone report from the lab, we refine the sensitivity and save 24 hours or more. The probability factor can then be balanced against the severity of the infection and the possible side effects of the drug in making a rational choice. This could be done on file cards, but computerization assures continual update. Patterns of changing flora or sensitivity can be immediately recognized. There are more elegant ways of doing this if you write your own programs—one of which would be to treat the sensitivities as a single binary number field.

The task of determining the effects of drugs on laboratory results has risen to staggering proportions because of the number of both new drugs and laboratory tests—and the time over which data has been collected. The computer listing of the National Institutes of Health (published as a special issue of *Clinical-Chemistry*) has over 10,000 entries of the way drugs alter laboratory tests. One of the most recurrent questions I am asked during the teaching seminar is "Why not computerize this list?" Indeed, at least one micro version has been offered. (The original NIH version was put in a large main-frame computer for a different reason: to collect the data with original references and collate it into many different sequences).

Drug effects are perfect examples of what not to computerize. Assuming one had the time and patience to put the data in, one would have to turn the computer on, wait while it warms up, load the operating system (and possibly the

Basic language), load the program, then start the query through a 10,000+ item list. Even assuming one had a fast hard disk and spelled the name of the test in an acceptable manner, it is a lot quicker to look it up.

Management functions

Most of the uses of the micro in managing a commercial or hospital laboratory as a business would not apply to the smaller clinic laboratory. Daily workload and equipment maintenance schedules, inventory and accounting have all been developed specifically for laboratories or adapted from existing commercial programs. For larger clinics, however, the laboratory may represent a significant cost center that is called upon to support departments that do not produce revenue such as the administrative and maintenance areas. In this circumstance, a predictive model of future test volume becomes valuable for deciding future capital expenditures, as well as ongoing expenses. FORCAST provides double exponential smoothing of past test volumes in order to predict growth trends. The standardized CAP Workload Recording System has also been programmed, in several versions, as a reproducible method of measuring clinical laboratory productivity. Many of the commercial financial spreadsheet and planning programs would also be adaptable to the lab.

Interpretive reporting

This represents the most significant development in the application of computers to clinical laboratory medicine. This in no way could be termed diagnosis by computer; it is an outgrowth of clinical pathologists' perception that laboratory medicine should offer something more than a set of numbers. The busy clinician should not have to spend time with reference books, or try to remember literally hundreds of different laboratory tests—each with exceptions, drug and sampling effects, normal ranges in a host of different systems of measurement, etc. The ideal interpretive report is provided to the requesting physician as a memory jogger and nothing more. It lists the values obtained by the test, the normal or usually expected results and the interpretation of the results by the clinical pathologist. The interpretation usually consists of a list of the most common conditions and exceptions for an abnormal value of that particular test, the most common drug interactions (by drug class) that could invalidate the test, and (where appropriate) suggestions for further testing when the results are equivocal.

Protein electrophoresis is a commonly ordered test in which serum proteins are separated into five fractions and quantitated. Almost all physicians easily recognize the common patterns; acute and

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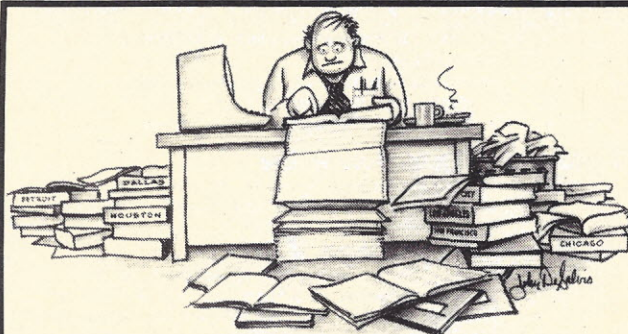
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chronic inflammation, cirrhosis, multiple myeloma, protein-losing nephropathy, etc. The usual laboratory report gives the percentage of each of the five fractions, possibly with a graph. Consider, however, the mathematical possibilities of five items, taken five at a time, each of which can have five states: elevated, very elevated, normal, depressed or very depressed. With the refinements of high-resolution electrophoresis, we detect 10 or more fractions and with immunoelectrophoresis 15 or more—each with at least five definable states. When the clinical pathologist looks at these results, he uses a psychological mind-set called pattern recognition, but if the volume is extensive, much time is consumed. The computer can be taught pattern recognition very easily. Furthermore, it can use the experience (literature) of many different authorities and, unlike the pathologist, never forgets.

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time after the primary infection. Interpretive reporting is needed to remind the physician of what the particular pattern means and answer the question "Where do we go from here?"

There are many more examples from the complicated test batteries modern labs are now able to perform. Some of the current programs available include Glucose Tolerance with graphic output and testing against three published criteria, Thyroid profiles, myocardial risk calculation, the cardiac enzyme profiles and many others. There is considerable effort going on in attempting pattern recognition for the large (20+) chemistry profiles; while this has been quite successfully done on large mainframes, the speed and memory restraints of the microcomputer have not yet resulted in any fully satisfactory implementations. The current generation of 16-bit microchips will soon make this practical, as well as the many other published algorithms using multidimensional analysis to refine the difference between the normal and abnormal testing results.

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Communications

At present, most reference labs use the voice telephone to deliver reports of potential immediate concern to the physician. Only the largest clinic groups can justify the inordinate expense of teletype. Voice calls usually find a non-technical person at the other end of the line. This necessitates endless repetition and increased potential for error. If you send a significant amount of testing to a reference lab, why not simply insist that the lab invest in a modem and send the reports directly to your printer?

Many of the programs mentioned are available from the CAP Software Exchange. Write to College of American Pathologists Computer Center, Box 1234, Traverse City, MI, 49684. □

Dr. Leo P. Biese is Chief Pathologist and Medical Director of New England Clinical Laboratories, Inc. in New Hampshire. His current interests are in interpretive laboratory programming and implementing diagnostic algorithms in the MUMPS language. He has previously written medical applications articles for IA.

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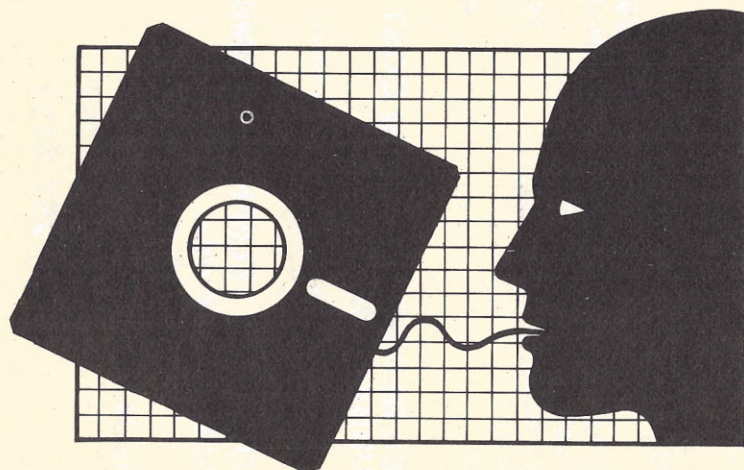
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CB-80

Continued from page 38



Listing 1. CB-80 string sorting program

```
REMARK \
sort an ASCII file by blocking \
to the longest record \
(BASIC version)

INTEGER long%, max%, L%, size%, nrow%, \
jump%, J2%, J%, J3%
STRING record$, old.file$, new.file$, \
pad$, hold$
DIM record$(550)

long% = 0
max% = 550
PRINT "Shell sort for string records"

START:
PRINT
INPUT "File to be sorted?"; old.file$

REM convert filenames to upper case
old.file$ = UCASE$(old.file$)
INPUT "New filename?"; new.file$
new.file$ = UCASE$(new.file$)
OPEN old.file$ AS 2
L% = 0
```

```
NEXT L%
PRINT L%;" Records processed"
GOSUB SHELL : REM sort records
CREATE new.file$ AS 1
FOR L% = 1 To nrow%
PRINT USING "&"; #1; record$(L%)
NEXT L%
CLOSE 1 : CLOSE 2
FOR L% = 1 To nrow%
PRINT record$(L%)
NEXT L%
GOTO START
```

SHELL:

```
REM \
Shell-Metzner sort routine \
A. R. Miller, BASIC Programs for \
Scientists and Engineers, Sybex, 1981
```

```
jump% = nrow%
WHILE jump% <> 0
jump% = INT(jump% / 2)
J2% = nrow% - jump%
J% = 1
WHILE J% <= J2%
L% = J%
WHILE L% > 0
J3% = L% + jump%
IF (record$(L%) <= record$(J3%)) \
THEN GOTO ORDER.OK
hold$ = record$(L%)
record$(L%) = record$(J3%)
record$(J3%) = hold$
L% = L% - jump%
WEND
```

ORDER.OK:

```
J% = J% + 1
WEND
WEND
RETURN : REM from Shell sort
```

ALL.DONE:

END

Listing 2. CB-80 program to test INKEY function

```
REMARK \
test INKEY function with CB-80
```



```

INTEGER true%, carr.ret%, p.char%
STRING acc.name$, pass.word$

true% = NOT 0
carr.ret% = 13

begin:
INPUT "Account name: "; acc.name$
PRINT "Password: ";
p.char% = INKEY
pass.word$ = CHR$(p.char%)
WHILE true%
  p.char% = INKEY
  IF (p.char% = carr.ret%) THEN GOTO p.end
  pass.word$ = pass.word$ + CHR$(p.char%)
WEND

PRINT
PRINT "Password is "; pass.word$
GOTO begin

END

p.end:

```

```

NEXTR:
IF END #2 THEN LAST
L% = L% + 1
IF (L% > max%) THEN GOTO TOO.BIG
READ #2; LINE record$(L%)
size% = LEN(record$(L%))
IF (size% > long%) THEN long% = size%
GOTO NEXTR

TOO.BIG:
PRINT "Lines exceed dimension of "; max%
GOTO ALL.DONE

LAST:
nrow% = L%
pad$ = ""
FOR L% = 1 TO nrow%
  pad$ = pad$ + " "
NEXT L%

REM \
pad out all records to longest record
FOR L% = 1 TO nrow%
  record$(L%) = \
LEFT$(record$(L%) + pad$, long%)

```

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Emergency Department Continued from page 85

tonic dehydration secondary to severe vomiting (hyperemesis) or diarrhea.

The patient is treated by giving about six liters of the appropriate intravenous solution over 24 hours and makes a good recovery.

The diagnosis of severe potassium depletion is not considered because the potassium concentration has to be "adjusted" in alkalosis. The "correction" is about 0.7 mEq/L for each 0.1 unit increase in the pH above a level of 7.4. In this case, the adjusted potassium level is about 3.5 mEq/L.

The accompanying metabolic analysis program was developed for a Radio Shack TRS-80 Model III, minimum 32K-byte disk system under TRSDOS 1.3, but is readily translatable to other Basics. It will quickly and accurately analyze 12 different acid-base conditions on the basis of blood gas data. Since each of these conditions may have numerous causes, the addition of serum electrolyte data allows branching through a series of different diagnoses with the addition of only six more brief data entries.

The program is menu-driven and may be used if only blood gas or only electrolyte data or both are known. Each entry is labelled and prompted by the program. The variable names used conform to standard medical notation whenever possible, eg. HCO_3 is the chemical notation and variable name for bicarbonate. The computer uses only the first two letters and ignores the rest of the word.

When the program is first run, it will be rather slow in generating the large 71-by-71 look-up table used to generate the acid-base conditions. Each of the 5,041 data elements, generated by program lines 30 through 70, represents a point taken from an empirically-derived plot of blood pH against the blood's partial pressure of carbon dioxide. It is likely that a reasonable degree of accuracy could be obtained with fewer data elements, but one of the strengths of the program is that it is quite accurate and specific in performing blood gas analysis.

Data must be entered very carefully. Lines 80 through 95 perform a check on the accuracy of the final data matrix. Once the matrix is built and the program is running correctly, it can be accelerated by saving the matrix as a special file. This is done by placing the following temporary lines in the program:

```
80 OPEN "O", 1, "DATAFILE": FOR X = 0 TO 70: X1$ =  
  STRINGS(71, "0"): FOR Y = 1 TO 71: MID$(X1$, Y, 1) =  
  CHR$(G(X, Y - 1)): NEXT Y  
85 PRINT+ 1, X1$: CHR$(13): NEXT X: CLOSE
```

Now run the program again and the data will be stored in on disk as "DATAFILE". These lines will save your data as a small string file and compress

Start blood gas analysis by using the large look-up table.
N is the value in the table that corresponds to the metabolic condition represented by pH and pCO₂.

```

130 CLS: PRINT "ENTER VALUES FOR pH, pO2, pCO2, and HCO3":
PRINT: INPUT "pH = "; PH: INPUT "pO2 = "; PO2: INPUT "pCO2 = "; PCO2: INPUT "HCO3 = "; HCO3: X=PH-7.1: IFX<0 THENX=-0
140 X=INT(X*100+0.5): IFX>70 THENX=70
150 Y!=PCO2-10: IFY<0 THENY!=0
160 Y=INT((Y*100+5)/100): IFY>70 THENY=70
170 N=G(X,Y): IFN=0 THEN$="These data represent blood gasses which are normal": GOTO320
180 DNNGOTO190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310
190 $="Metabolic acidosis... without expected respiratory compensation": GOTO320
200 $="Mixed metabolic acidosis and respiratory acidosis...check for salicylate poisoning or methemoglobinemia": GOTO320
210 $="Mixed respiratory and metabolic alkalosis.": GOTO320
220 $="Mixed respiratory and metabolic acidosis...Check for narcotic overdose in a child": GOTO320
230 $="Mixed respiratory acidosis and metabolic alkalosis.": GOTO320
240 $="Metabolic alkalosis... without the expected respiratory compensation": GOTO320
250 $="Metabolic acidosis...check for grand mal seizures or methanol poisoning": GOTO320
260 $="Acute respiratory acidosis...check for late asthma or for narcotics in adult": GOTO320
270 $="respiratory acidosis either chronic or acute.": GOTO320
280 $="Chronic respiratory acidosis. Check for COPD ": GOTO320
290 $="Metabolic alkalosis.": GOTO320
300 $="Acute respiratory alkalosis... check for early asthma or methemoglobinemia": GOTO320
310 $="Chronic respiratory alkalosis... check for phencyclidine": GOTO320
320 CLS: POKE16916,5: PRINT "pH ="; PH, "pCO2 ="; PCO2, "pO2 ="; PO2, "HCO3 ="; HCO3: OX=PO2-(154-1.66*PCO2): AA=154-(PCO2*1.2)-PO2: PRINT "THE OXYGEN GAP IS "; OX; TAB(45) " ( n1 = +/- 10 ) ": PRINT "THE AVEOLAR-ARTERIAL GAP IS "; AA; TAB(45) " ( n1 < 30 < 19 )
330 PRINT: PRINT$: L1=1: PRINT: PRINT@896, "Press 'E' for electrolytes on SAME PATIENT, 'N' for NEW PATIENT"
340 A$=INKEY$: IFA$="" THEN340
350 POKE16916,0: IFA$<>"E" THENL1=0: GOTO100

```

Electrolyte analysis begins here.

```

360 CLS: INPUT "GLUCOSE ="; GLU: INPUT "BUN ="; BUN: INPUT "SODIUM ="; NA: INPUT "CHLORIDE ="; CL: INPUT "POTASSIUM ="; K: INPUT "CO2 ="; CO2: IFGLU<15 OR NA<110 OR K>8 OR CL<80 OR CO>40 THEN370 ELSE400
370 CLS: PRINT "PLEASE CHECK YOUR DATA...YOU HAVE ENTERED: ": PRINTTAB(10) "GLUCOSE ="; GLU: PRINTTAB(10) "BUN ="; BUN: PRINTTAB(10) "Na ="; NA: PRINTTAB(10) "Cl ="; CL: PRINTTAB(10) "K ="; K: PRINTTAB(10) "CO2 ="; CO2
380 PRINT: PRINT "IF THIS IS CORRECT PRESS (C) OTHERWISE PRESS (W) AND REENTER THE DATA.": A$=""

```

two bytes of data into one—making input much faster.

To read the data after compressing and saving it as a disk file, delete lines 30 through 85 and insert the following lines:

```

30 OPEN "1", 1, "DATAFILE"
40 FOR X = 0 TO 70: LINEINPUT X$
50 FOR Y = 1 TO 71: G(X,Y-1) = ASC(MID$(X$,Y))
NEXT Y: NEXT X: CLOSE

```

Translation to other forms of Basic will simply require changing the DEF FN in line 10 to a subroutine and substituting other screen graphic routines for the POKE's and PRINT@ routines in TRS-80 Basic. Computers that do not have the TRS-80's line editing function, MIDs, may use other methods to store the data matrix or leave the program as it is listed below.

Use of a computer does not excuse one from using common sense and good judgement. There might be special circumstances in which diagnosis or treatment might differ from that suggested by the computer analysis. It is also possible for a patient to have more than one disease at a time and it would be improper to rely solely on the computer for a diagnosis.

Dr. Robert Anthansiou is Assistant Director of the Emergency Department at Samaritan Hospital, Troy, NY. Besides his MD, he holds degrees in electrical engineering, psychology and social psychology. He has written over 35 published articles.

Program listing

```

10 CLEAR1000: CLS: DEFINT I,J,G,X,Y: DIM IY, Y, J, I, X, G(70,70): DEF FNCS$(A$,A)=STRING$(A$/2-LEN(A$)/2-0.5,"")+A$: POKE16420,1
20 PRINT@512, FNCS$("THE MACHINE IS READING DATA; PLEASE WAIT",64);
30 FORX=0TO70: Y=0
40 READ I,J
50 FORIY=1 TO I: G(X,Y)=J: Y=Y+1: IF Y>70 THEN GOTO 70
60 NEXTIY: GOTO 40
70 NEXTX
80 FORX=0TO70: FORY=0TO70: G1=G1+G(X,Y): NEXTY: NEXTX
90 IFG1=30786 THENCLS: PRINT "YOUR DATA ARE CORRECT. REMOVE LINES 80 - 95 AND RERUN PROGRAM.": STOP
95 PRINT "YOUR DATA CHECKSUM IS ";G1; ". IT SHOULD BE 30768. CHECK YOUR DATA STATEMENTS CAREFULLY.": STOP

```

Initialize variables and print menu

```

100 POKE16916,0: CLS: PRINTFNCS$("METABOLIC ANALYSIS",64): S$="": PC=0: GL=0: NA=0: PO=0: PH=0: HC=0: BU=0: CL=0: K=0: OG=0: OX=0: AA=0: CO=0: OS=OL=OG=0: PRINT: PRINTFNCS$("<ENTER> THE NUMBER OF YOUR CHOICE",64): PRINT: PRINTTAB(20) "1. BLOOD GAS ANALYSIS"
110 PRINTTAB(20) "2. ELECTROLYTE ANALYSIS": PRINTTAB(20) "3. QUIT AND RETURN TO DISK MENU": PRINT: INPUT "YOUR CHOICE IS..": AZ: IFAZ<10RAZ>3 THEN100
120 ONAZGOTO130, 360, 840

```



```

390 A$=INKEY$: IFA$="" THEN 390 ELSE IFA$<>"C" THEN 360
400 INPUT "ENTER OSMOLALITY (if not avail. enter 99)": OSM:
    AG=NA-(CL+CO2): OL=2*NA+BUN/2.8+GLU/18: IF OSM<=99 THEN OG=0 ELSE
    OG=OSM-OL
410 CLS: POKE 16916,5: PRINT "glu =": GLU; TAB(10) "BUN
    =" : BUN; TAB(20) "Na =" : NA; TAB(30) "Cl =" : CL; TAB(40) "K
    =" : K; TAB(50) "CO2 =" : CO2: PRINT "THE ANION GAP IS " : AG; :
    PRINT TAB(45) " ( nl = 8 - 12 ) ": PRINT "THE OSMOLAR GAP IS
    " : OG; : PRINT TAB(45) " ( nl < 10 ) "
420 PRINT "The calculated osmolality is": OL; " mOsm": PRINT:
    IFL1=1 THEN AZ=INSTR(S$,"."): S$=LEFT$(S$,AZ): PRINT @320,S$

```

With electrolyte and blood gas data the program now branches to possible diagnoses.

```

430 PRINT: IFL1=1 THEN ON N GOTO 460, 460, 750, 710, 710,
    660, 460, 710, 710, 710, 660, 750, 750

```

```

440 PRINT "Proper interpretation of acidosis or alkalosis
    should include blood pH."
450 PRINT "A low CO2 may indicate either metabolic acidosis
    or respiratory alkalosis; a high CO2 may indicate either
    metabolic alkalosis or respiratory acidosis": GOSUB 820 :
    IFCO2>32 GOTO 660

```

METABOLIC ACIDOSIS

```

460 IF AG>12 GOTO 530 'increased anion gap
470 IF AG<8 GOTO 790 'decreased anion gap
480 IF K>3.5 GOTO 510 'normal or increased potassium
490 PRINT @384,"IF ACID URINE: " : TAB(32) "IF ALKALINE URINE: "
500 PRINT "DIARRHEA"; TAB(32) "ACETAZOLAMIDE": PRINT "AMMONIUM
    CHLORIDE"; TAB(32) "SULFAMYLON": PRINT "RENAL TUBULAR ACIDOSIS"
510 PRINT: PRINT "IF NORMAL OR INCREASED POTASSIUM, CHECK:
    adrenal insufficiency, propoxyphene, ureteral diversion,
    hyperalimentation, isopropanol uropathy (uremia,
    interstitial nephritis, hydronephritis)": PRINT
530 GOSUB 820 : PRINT @512,"ARE SERUM OR URINE KETONES PRESENT
    (Y/N/?)"
540 A$=INKEY$: IFA$="" THEN 540 ELSE IFA$<>"Y" THEN 600
550 IF GLU>200 GOTO 590
560 PRINT "CHECK FOR: " : PRINT " STARVATION, ETHANOL
    INGESTION, SALICYLATE POISONING"
570 PRINT: PRINT "If ethanol is likely and you are willing to
    assume that the osmolar gap is only due to ethanol, press
    'Y' for an estimate of the blood alcohol level."
580 A$=INKEY$: IFA$="" THEN 580 ELSE IFA$="Y" GOTO 810 ELSE 100
590 PRINT @512,"** MOST LIKELY DIAGNOSIS IS DIABETIC
    KETOACIDOSIS **": GOSUB 820 : GOTO 100
600 IF GLU>200 THEN PRINT "DIABETIC KETOACIDOSIS OR HYPEROSMOLAR
    DEHYDRATION"
610 PRINT "ETHYLENE GLYCOL, METHANOL, STARVATION,
    ETHANOL, SALICYLATES": IF BUN>25 PRINT "UREMIA"
620 PRINT "FORMALDEHYDE, IRON INGESTION, ISONIAZID, NALIDIXIC
    ACID, TOLUENE (glue sniffing)": PRINT "LACTIC ACIDOSIS DUE TO
    ...": IFL1=1 AND ABS(OG)>10 GOTO 640
630 PRINT "SEIZURE, PHENFORMIN, MALIGNANCY, PROPYLENE
    GLYCOL, " :
640 PRINT "SHOCK, HYPOXIA, METHEMOGLOBINEMIA, CARBON
    MONOXIDE, CYANIDE, H2S, LIVER FAILURE": PRINT: GOSUB 820 :
    IFL1=1 GOTO 100 ELSE CLS: PRINT @384,"TO REVIEW THE DIAGNOSIS
    OF RESPIRATORY ALKALOSIS... PRESS <R> PRESS <M> TO RETURN
    TO MENU"

```

```

650 A$=INKEY$: IFA$="" THEN 650 ELSE IFA$="R" THEN 710
    ELSE GOTO 100

```

METABOLIC ALKALOSIS

```

660 IFL1<>1 THEN PRINT @320,FNCN$("METABOLIC ALKALOSIS",64)
670 PRINT @384,"(nonparathyroid hypercalcemia,
    hypoparathyroidism, milk alkali": PRINT "syndrome, recovery
    phase of keto- or lactic acidosis.): PRINT "If Urine
    Chloride <10 mEq/L": TAB(32) "If Urine Chloride >20 mEq/L"
680 PRINT "HYPEREMESIS"; TAB(33) "HYPERALDOSTERONISM": PRINT "GA
    STRIC SUCTION"; TAB(33) "DOCA EXCESS": PRINT "DIURETICS
    (late)": TAB(33) "CUSHING'S SYNDROME: PRINT "DIARRHEA";
    TAB(33) " LICORICE"
690 PRINT "POST-HYPERCAPNEIC ALK": TAB(33) "SEVERE POTASSIUM
    DEPLETION": PRINT "CYSTIC FIBROSIS": GOSUB 820 :
    IFL1=1 GOTO 100 ELSE CLS: PRINT @384,"TO REVIEW THE DIAGNOSIS
    OF RESPIRATORY ACIDOSIS... PRESS <R>, PRESS <M> TO RETURN
    TO MENU"
700 A$=INKEY$: IFA$="" THEN 700 ELSE IFA$<>"R" THEN 100

```

RESPIRATORY ACIDOSIS

```

710 IF L1<>1 PRINT @384,FNCN$("RESPIRATORY ACIDOSIS",64)
720 IF ABS(OX)>10 GOTO 740
730 PRINT "** CAUTION THIS PICTURE MAY CHANGE **":
    PRINT "NARCOTICS, BOTULISM, NEUROMUSCULAR DISEASE,
    HYPOVENTILATION,"
740 PRINT "INHALATION OF PULMONARY IRRITANTS, HYDROCARBON
    INGESTION, ASTHMA, FOREIGN BODY ASPIRATION, LATE PULMONARY
    EMBOLISM, COPD, PNEUMONIA, PULMONARY EDEMA, PNEUMOTHORAX":
    PRINT: GOSUB 820: GOTO 100

```

RESPIRATORY ALKALOSIS

```

750 IFL1<>1 THEN PRINT @384,FNCN$("RESPIRATORY ALKALOSIS",64)
760 IF AA<10 GOTO 780 'low AA rules out line 770
770 PRINT "PULMONARY EMBOLI, CHF, PNEUMONIA, INTERSTITIAL
    LUNG DISEASE"
780 PRINT "ANXIETY, HEAD TRAUMA, BRAIN TUMOR, CVA, FEVER,
    SALICYLATES": PRINT: GOSUB 820: GOTO 100
790 PRINT "A REDUCED ANION GAP OF": AG; " IS UNUSUAL BUT MAY BE
    CAUSED BY: " : PRINT "dilution, hypoalbuminemia, severe
    hyponatremia (Na=" : NA; ")", hyperviscosity (myeloma),
    Bromism, paraproteinemia, hypermagnesemia (antacid
    overdose);
800 PRINT " or treatment of toxemia/eclampsia), Lithium
    toxicity, or hypercalcemia.": PRINT: GOSUB 820: GOTO 100

```

BLOOD ALCOHOL ESTIMATE

```

810 E1=OG*5: T1=E1/15: PRINT "THE ESTIMATED BLOOD ALCOHOL
    IS": E1; " mg/DL": PRINT "MORE THAN": T1; " HOURS MAY BE
    REQUIRED BEFORE THE BLOOD ALCOHOL LEVEL IS NEAR ZERO":
    PRINT: GOSUB 820: GOTO 100

```

SINGLE KEY WAIT SUBROUTINE

```

820 PRINT @960,CHR$(244);CHR$(245);CHR$(246);" PRESS ANY KEY
    TO CONTINUE";
830 IF INKEY$="" THEN 830 ELSE RETURN
840 POKE 16916,0: END

```


900	DATA	1,	2,	10,	7,	19,	1,	41,	4,	1,	2,	10,	7,	19,	1,
		41,	4,	1,	2,	10,	7,	19,	1,	41,	4,	1,	2,	11,	7,
		41,	4,	3,	2,	10,	7,	17,	1,	40,	4,	1,	8,	3,	2,
		16,	1,	38,	4,	3,	8,	4,	2,	11,	7,	15,	1,	36,	4,
		2,	10,	7,	14,	1,	33,	4,	7,	8,	1,	9,	7,	2,	1,
910	DATA	7,	2,	10,	7,	13,	4,	8,	2,	9,	8,	2,	11,	7,	11,
		11,	7,	12,	1,	31,	4,	8,	2,	9,	8,	2,	11,	7,	11,
		29,	4,	9,	8,	3,	9,	9,	2,	11,	7,	10,	1,	28,	4,
		9,	9,	2,	11,	7,	10,	1,	26,	4,	9,	8,	6,	9,	8,
		9,	1,	24,	4,	10,	8,	7,	9						
920	DATA	11,	2,	10,	7,	9,	1,	22,	4,	11,	8,	7,	9,	1,	10,
		12,	2,	10,	7,	8,	1,	20,	4,	11,	8,	8,	9,	2,	10,
		10,	7,	8,	1,	19,	4,	10,	8,	7,	9,	5,	10,	12,	2,
		7,	1,	17,	4,	11,	8,	6,	9,	7,	10,	13,	2,	11,	7,
		15,	4,	11,	8,	6,	9,	9,	10						
930	DATA	14,	2,	10,	7,	6,	1,	13,	4,	12,	8,	4,	9,	14,	10,
		14,	2,	11,	7,	5,	1,	11,	4,	12,	8,	4,	9,	14,	10,
		10,	7,	5,	1,	10,	4,	11,	8,	3,	9,	17,	10,	15,	2,
		4,	1,	9,	4,	7,	8,	5,	9,	20,	16,	2,	10,	7,	4,
		4,	4,	8,	8,	9,	21,	10,	16,	2,	11,	7,	3,	1,	7,
		9,	9,	19,	10,	3,	5,	17,	2,	11,	7,	2,	1,	6,	4,
		9,	17,	10,	7,	5									
940	DATA	17,	2,	8,	7,	11,	0,	1,	8,	9,	9,	15,	10,	10,	5,
		17,	2,	8,	7,	11,	0,	8,	9,	13,	10,	14,	5,	18,	2,
		11,	0,	6,	9,	12,	10,	17,	5,	18,	2,	7,	7,	11,	0,
		8,	10,	21,	5,	19,	2,	6,	7,	11,	0,	4,	9,	7,	10,
		20,	2,	5,	13,	11,	0,	3,	9,	5,	10,	27,	5,	17,	2,
		1,	12,	11,	0,	2,	9,	3,	10,	30,	5				
950	DATA	12,	2,	10,	13,	3,	12,	11,	0,	3,	10,	32,	5,	8,	5,
		2,	14,	13,	3,	12,	11,	0,	7,	11,	28,	5,	2,	18,	13,
		12,	11,	0,	11,	11,	24,	5,	20,	13,	5,	12,	25,	11,	21,
		18,	13,	5,	12,	2,	3,	28,	11,	18,	5,	17,	13,	6,	12,
		3,	28,	11,	18,	5,	16,	13,	6,	12,	3,	3,	28,	11,	18,
960	DATA	13,	13,	6,	12,	4,	3,	28,	11,	18,	5,	14,	13,	7,	7,
		12,	4,	3,	28,	11,	18,	5,	12,	13,	8,	12,	5,	3,	28,
		18,	5,	11,	13,	9,	12,	5,	3,	28,	11,	18,	5,	10,	13,
		12,	6,	3,	28,	11,	18,	5,	8,	13,	11,	12,	7,	3,	27,
		18,	5,	7,	13,	11,	12,	9,	3,	26,	11,	18,	5,	5,	13,
		12,	14,	3,	23,	11,	18,	5							
970	DATA	4,	13,	11,	12,	15,	3,	2,	6,	21,	11,	18,	5,	3,	12,

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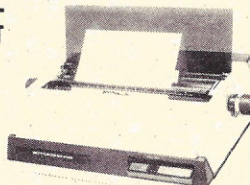
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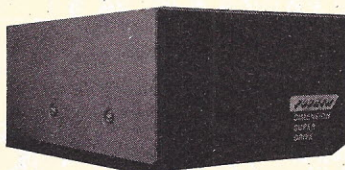
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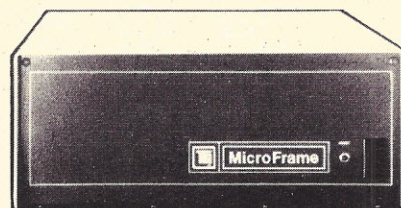
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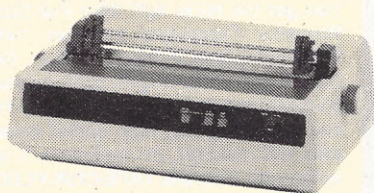
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II DCH2901D	CP/M® 8" Terminal Program for above	\$ 25.00	
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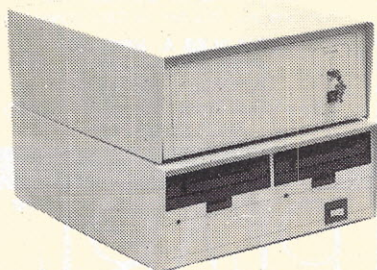
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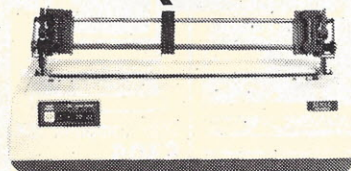


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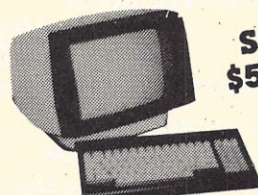
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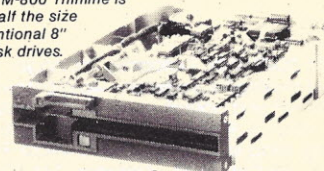
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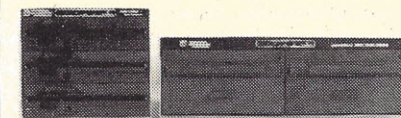
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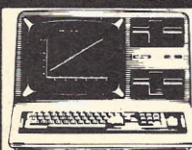
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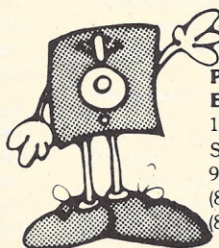
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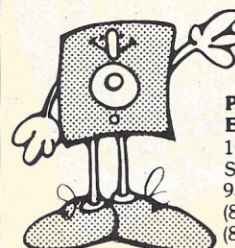
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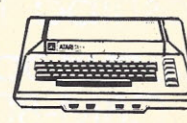
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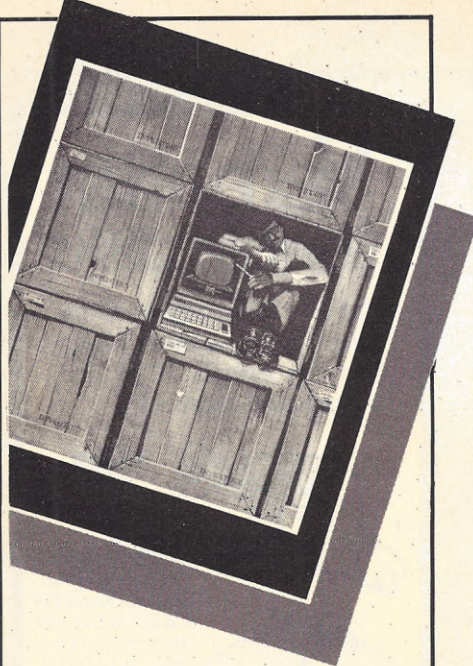
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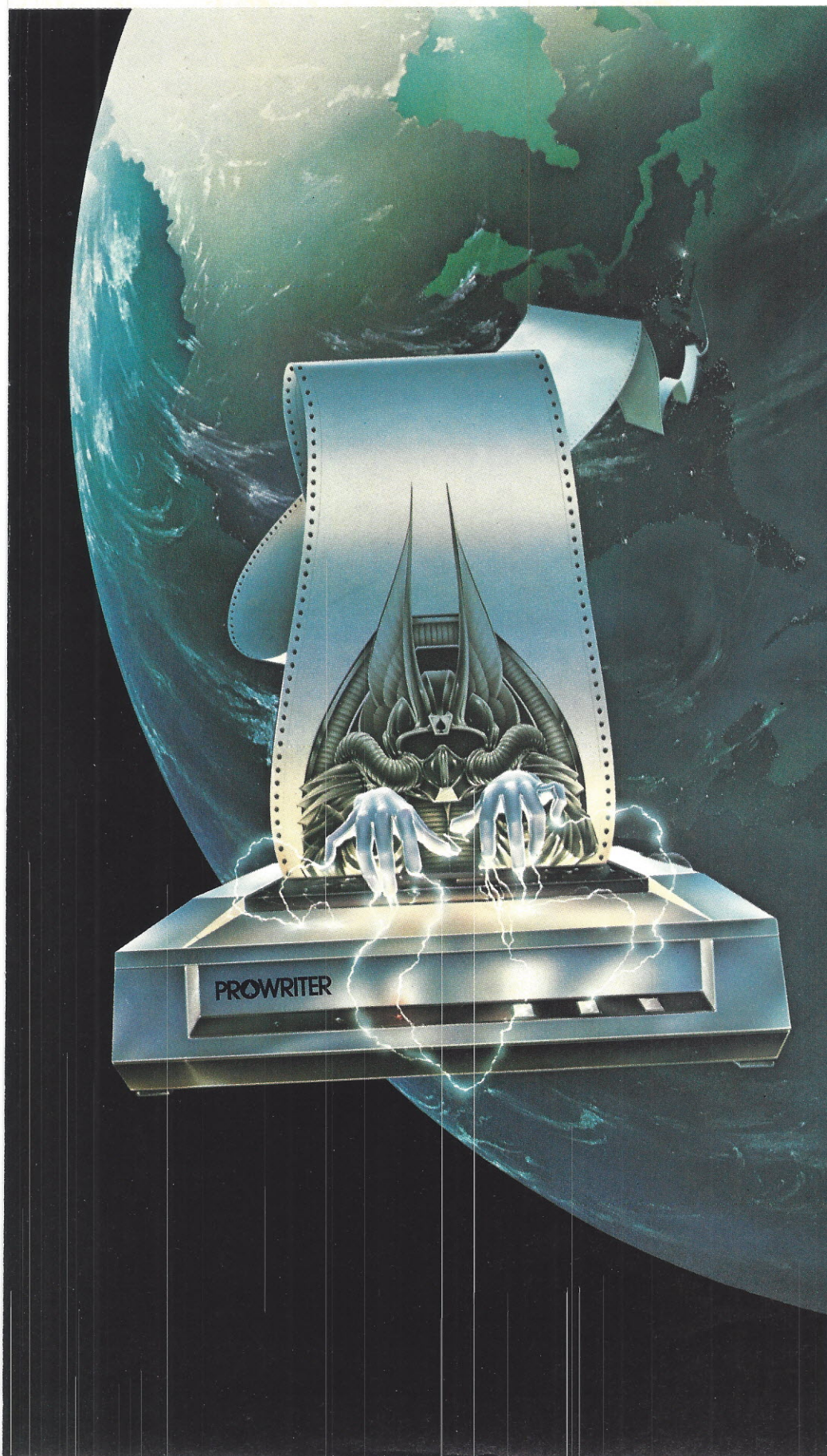
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